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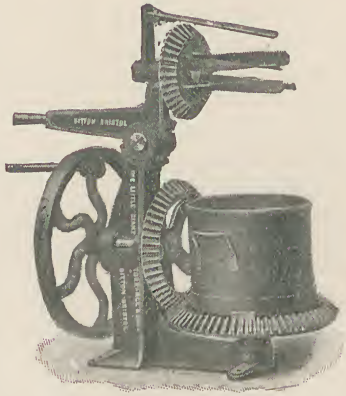

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PAINT AND PAINTING DEFECTS; THEIR DETECTION, CAUSE AND CURE

"THE DECORATOR" SERIES OF PRACTICAL BOOKS
No. 9
Edited by ARTHUR SEYMOUR JENNINGS

PAINT & PAINTING DEFECTS

their

DETECTION, CAUSE & CURE

By

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Preface.

Everyone who has had to do with the ordinary materials used by Painters and Decorators has become familiar at some time or other in the course of his experience with faults or blemishes in the finished work.

The investigation of such defects is often a matter of no little complexity and difficulty, and there is frequently a tendency on the part of the sufferer to attach blame to an individual or to a material unjustly, without appreciation of the numerous and varied causes which have been at work, and without due regard to the variety of effects which may have followed these causes.

The present volume aims at presenting in a simple manner, freed as much as possible from technical terms and scientific language, the nature and chief causes of commonly occurring defects in work finished with paint, enamel or varnish. In order to promote ease in reference the matter has been arranged alphabetically, and paragraphs have been included which describe briefly many of the ordinary materials used in the manufacture of modern paints, and also methods and processes familiar to painters and others.

It is hoped that interest will thus be stimulated in the minds of users of paint in the nature and properties of the materials which they handle and that manufacturer of paints, enamels and varnishes may also gain a little more insight into the extremely complex conditions under which their products are employed.

Although no claim is made that the present work is exhaustive the Author hopes that it will be regarded as a sincere attempt to bridge the gulf between maker and user, and as an aid in dealing with complaints and difficulties in a logical and scientific and especially a practical manner.

The book may also be found helpful and interesting to owners of property, architects and others who are interested in the every day language of paints and painting.

J. CRUICKSHANK SMITH.

London, October, 1912.

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PART I.

INTRODUCTORY.

The Investigation of Defects Concerns both the Manufacturer and the User.

When one begins to investigate the enormous variety of conditions under which paint materials are used one ceases to wonder at the production of abnormal results and is inclined to express surprise that so few jobs on the average "go wrong." Nevertheless, it cannot be denied that all defects and blemishes, from whatever cause they may arise, are disappointing. They are doubly so to the practical painter, for not only may he be required to spend time and money in endeavouring to rectify what is amiss but he feels that his reputation as a craftsman is in danger of being called in question.

The manufacturer who has supplied the materials is interested in a precisely similar manner, and the result is that there often arises a futile and unedifying wrangle as to who is to endure the odium or pay the piper.

FAIR-MINDED INVESTIGATION AND EXACT STATEMENT OF FACTS NECESSARY.

It happens not infrequently that the user puts himself in the wrong at the outset by rashly (and at times offensively) assigning all the blame for a certain defect in the work to the manufacturer, even when the slightest fair-minded investigation would have proved that such a contention was absurd. On the other hand manufacturers may, and sometimes do, unjustly attribute a defective result to bad or careless workmanship when it can be proved that the painter is fully qualified and has devoted special attention to the job. Hence it is always wise before any course of action involving the fixing of responsibility on an individual or company is decided on (1) to determine the facts of the case ; (2) to study the local conditions and see to what extent they may have influenced the result ; (3) to communicate the impressions which have been formed to the other interested parties in a courteous but if necessary a perfectly firm manner, avoiding imputations of fraud, wilful negligence or inefficiency unless these can be proved up to the hilt. It is wonderful how apparent mysteries yield to the systematic attack of two or more minds working from different points of view and which are honestly endeavouring to arrive at the solution of a problem in which all are interested.

DEFECTS MAY BE INEVITABLE.

Everyone knows that defects are much more frequently found on jobs which have been "scamped" or which have been carried out in a slovenly manner than on those on which good work has been expended. But it is also common knowledge that even on the

best jobs defects sometimes become apparent, that after every precaution has been taken that skill and experience suggest in the way both of using good materials and of employing qualified and careful workmen, some flaw may manifest itself to the discomfiture of all concerned.

Chief Causes of Defects.

Defects in painting work (and the latter term is to be understood as comprising all sorts of work involving the application of the ordinary paint materials—paint, enamel, varnish, distemper and water-paint, scumbling, glazing, graining and the like) may be classified according to the nature of the defect—blistering, peeling, blooming, etc.—but it is well to summarise also the chief classes of agencies which give rise to abnormal results.

The following classification does not pretend to be exhaustive, but it may be found to be suggestive and to assist the painter or paint-user to suggest a cause for some unusual or abnormal appearance, and it may emphasize the fact that the materials are not always or even usually to blame :—

I. Influence of Weather and Climate.—Rainy weather, moist or bad drying weather, intense cold, great heat—all these conditions affect the result prejudicially.

II. The Nature of the Surface.—Damp in stone or other porous surfaces may manifest itself after the surface has been painted causing softening and discolouration. Wood may exude resin which causes peeling. Metal work may expand which causes cracking. Cement work may effloresce.

III. Action of the Undercoatings (Mechanical).—Unless the various films are "bound'

in such a manner that they cannot expand and contract unequally defects (*e.g.*, cracking) are liable to appear.

IV. CHEMICAL ACTION either between the constituents of the paint or varnish themselves, or between these and some constituent of the surface. Adding terebine or gold size to varnish is very liable to injure the gloss ; painting over caustic lime with chrome or Prussian blue results in injury to the colour. Imperfect drying of the undercoat also comes under this heading.

When a particular defect or complaint has to be investigated the root of the matter will probably be found when the investigator is able to relegate the abnormal result to one or other of the above-mentioned groups. The latter may be subdivided or extended almost indefinitely Such matters fall within the scope of the "technology of painting," a subject which is as vital to the modern craftsman as the "technology of paints" is to the up-to-date manufacturer, but which is sadly neglected in trade classes and courses of instruction.

ON FIXING RESPONSIBILITY.

There may be as many as four persons on one or other or several of whom the responsibility for the result of the work may rest, namely :—

(1.) The architect who frames the specification according to which the surface is prepared and the material selected and applied and who is responsible to his client for advising him and for supervising the carrying out of the work by the painter.

(2.) The manufacturer who supplies the material.

(3.) The painter who applies the material.

(4.) The property owner for whom the work is done.

THE ARCHITECT incurs responsibility if he does not frame suitable specifications for the preparation of the surface and for the selection and application of the paint, or if he fails to see that the specification is duly carried out. He can avoid or limit his responsibility if he reports to the person for whom he is acting any fact which in his opinion will prevent the surface being properly prepared or the work producing the results the client has instructed him to attain, but in such a case he must explain fully to his client the defects which he thinks are unavoidable, and receive his express instructions to proceed notwithstanding.

THE MANUFACTURER incurs responsibility if he sells materials which do not conform to the description attached to them or if being sold under an ordinary and well-known trade description and at a fair price they are palpably defective or inferior. There is an implied warranty that goods sold by a seller (whether he be the manufacturer or not) in the course of his business for a particular purpose are fit for that purpose, but the seller must be made aware of such purpose and the goods must be used or applied under usual and reasonable conditions.

THE PAINTER incurs liability if the materials are improperly or carelessly applied. A painter in undertaking work warrants himself to be an expert and skilled in his work, and in spite of any responsibility which may apparently rest with the manufacturer it may be held that a painter incurs responsibility in continuing to use material which can be shown to be palpably defective or unsuitable. If a painter is expressly instructed by the architect or client to use materials or to employ processes which from his practical skill as a craftsman he considers to be unsuitable, he does so at his own risk, unless before

proceeding with the contract he brings to the notice of the architect such unsuitability and repudiates responsibility.

THE PROPERTY OWNER OR CLIENT usually causes the responsibility for a perfect result to fall upon one or other of the architect, manufacturer or painter, but he assumes responsibility if he takes upon himself some of the advisory and supervising duties of the architect, or takes the advice of the manufacturer or painter. In such cases he must give the fullest information to whomever he relies on, and must give him proper facilities to learn all the circumstances relevant to the surface to be painted and the use and wear to which it is to be subjected, and he must disclose to the person upon whom he is relying every material fact which may affect the advice which he seeks.

Although there are frequently occasions in connection with painting contracts when legal intervention might be warranted, it says much for the honesty of purpose and the good sense of all concerned that recourse is so seldom had to the law courts in such matters. Difficulties and disputes of a minor nature are usually settled in a friendly spirit of give and take, this attitude being largely due to the fact that every really fair-minded and practical man, be he architect, painter or manufacturer, knows that the laws of nature are not subject to modification by legal contracts, and that when unforseen trouble arises for which no one is to blame it is best for all the parties concerned to co-operate amicably in surmounting the difficulty.

HOW TO INVESTIGATE THE CAUSE OF A DEFECT.

First establish the facts, and in this connection

it may be noted how frequently it happens that statements are made, theories propounded and deductions drawn without the bed-rock facts and circumstances of the case having been ascertained, or if ascertained taken fully into account.

Painters' complaints, which are, unfortunately, a by-word in the trade, are often initiated in something after this fashion. A journeyman painter towards the close of a hot summer day found that some enamel paint near the bottom of his paint-pot was "working very tough," on account, probably, of evaporation of the turpentine and a little settling of the pigment to the bottom. He found difficulty in "laying off" the paint, and his foreman pointed out that the work was "ropy" and unsatisfactory. Instead of explaining what had happened, the painter got sulky and asserted that this particular enamel "always went like that," a statement which could easily be disproved by an examination of the same man's work earlier in the day. The foreman, whether actuated by excess of zeal or not one cannot say, entered a formal complaint with his master that the enamel paint was "all wrong," that it "tore the mens' arms off," that it "wouldn't flow," and more to the same effect. The master decorator, without examining the work or investigating the matter, told his clerk to write to the manufacturer (who, by the way, was a hundred miles distant) desiring him to send someone to the job at once, as there was a serious complaint about the paint. A special journey was made by a skilled representative, who being a wise man had a fresh can of the paint opened and with his own hand laid it on to a flank and demonstrated that the whole thing was a mare's nest.

Of course the foregoing illustration, which actually occurred, is an extreme one, but it is typical

of not a few "complaints" which are merely a source of irritation and expense to the manufacturer.

Many complaints arise from attempts to achieve the impossible, as for example when a specification for turning an old oak-grained dado, which had been much knocked about and repeatedly bees-waxed, into a white enamel finish read as follows:—"Rub down and prepare and finish with two coats of———— enamel, of which one coat may be undercoating." Such a specification makes any practical man smile—unless he has the contract to carry out the work!

Every complaint, then, of a serious nature and every report on a defect which manifests itself after the work is completed should be accompanied by a clear statement of the facts relevant to the case so far as it is possible to ascertain them. Thus:—

STATEMENT OF ESSENTIAL FACTS.

Defect or complaint	[State precisely the appearance objected to, or the feature in the material which constitutes the complaint.]
at	[Address of job.]
on	[State whether inside or outside, and whether n walls, ceilings, dados, window frames, or doors, etc., etc.]
Work finished with	[Name or description of material.]
Supplied by	[Name and address of manufacturer.]
To	[To whom invoiced, with date].

To what condition as to temperature, moisture, gases, stress, sunlight and other outside agencies has the surface been exposed ?	
Full description of undercoats	
Supplied by	[Name and address of manufacturer.]
To	[To whom invoiced, with date]
Full description of surface below undercoats	[State whether old paint, distemper, etc., or whether new wood or plaster, cement, etc.]
Condition of surface when treated	
Preparation given to surface before painting	
Dates between which work was carried out	
Notes as to weather during painting	
Is the defect one with which you are familiar ?	
To what do you ascribe it ?	
Special notes re construction of walls, etc., where relevant.	

Other important facts have to be established before any manufacturer can effectively deal with a complaint. Such facts are :—

1. Whether the manufacturer in question did in fact supply the goods complained of.

2. Whether (assuming he supplied them) they were mixed with other materials (oil, turps, driers, staining colours, etc., etc.).

3. Whether (assuming the answer to 2 to be in the negative) the goods supplied were suited to the conditions as now disclosed.

It is only when information on all these points as well as answers to the questions relevant to the case in point included in the list on page 16 are forthcoming that a searching investigation can be made as to the possible or probable cause of the effects produced.

All this is not such a complicated process as it seems, and a habit of methodical treatment of such matters is soon acquired.

LOGICAL REASONING NECESSARY.

The process of discovering or suggesting the true cause of any defect or abnormality in painters' work or materials may be divided into two parts :—

(1) *The determination of the facts relevant to the problem in question.* This may be effected either by personal observation or by collecting and sifting the evidence of others. Two important sources of error may arise during this stage, one the tendency (common to all human beings) to make incomplete, vague or erroneous observations, the other the readiness with which a narrative of fact becomes exaggerated, mutilated or distorted after it has passed through several hands. Many cases have come under the writer's notice in which some phenomenon or condition which had been confidently relied upon to explain a defect did not, as a matter of fact, exist. Hence a great practical rule which should be observed by all those

endeavouring to determine bed-rock facts is "take nothing for granted."

(2) *The drawing of conclusions from the evidence.* These conclusions will be sound or the reverse according to the degree to which the reasoning whereby they are arrived at conforms to the recognised principles and rules of logic. Erroneous conclusions are sometimes arrived at through confusion having arisen in the tracing of cause and effect. One cause may produce several different effects, and several totally distinct causes may give rise to the same effect. Sometimes the possible causes of a certain effect may be gradually reduced in number by patient and intelligent investigation until the real cause is discovered. At other times it must remain a moot point which of a number of possible causes is the most probable cause

A fallacy which is not uncommon consists in assigning as the cause of an effect some circumstances incidentally coupled with it. An illustration of fallacious reasoning of this kind would be to argue that white spirit detected in a sample of varnish which had bloomed was the cause of the blooming.

There are some people (in other walks of life besides the painting trade) whose minds are so unused to logical reasoning and who find such difficulty in tracing cause and effect that they are quite incapable of threading their way through the maze of a complicated research involving the elucidation of obscure factors. To such one would say : Instruct a competent paint expert to act on your behalf and be guided by his advice.

PART II.

ALPHABETICAL LIST OF FAULTS AND DEFECTS WITH NOTES ON MATERIALS AND PROCESSES.

The same defect or phenomenon is often described by painters by a variety of names, and again, the same name is frequently employed to describe different effects. As far as possible the most usual terms and their significance have been employed in the following alphabetical list.

A

ABSORPTIVE SURFACES.

Every surface which is about to be painted must in the first instance be brought to a uniform and equally absorbent bearing. If this is not done great waste of time and materials will arise, and from the decorative point of view the result will never be satisfactory. If a glossy paint is applied to an unequally absorbent surface the result will be "sheary," and if a coloured water paint or distemper is used the surface will dry unevenly, appearing light on those spots where the suction is greatest. Many cases of so-called bleaching of the pigments in distemper and water paint are in reality instances of unequal absorption.

Absorbent surfaces are frequently best treated

in the first instance with some material of the nature of a filler in order that the pores of the surface may be filled up and absorption rendered uniform. A coat of size (claire-colle or clere-cole) is often applied by painters as a quick method whereby to stop undue absorption. (See CLAIRE-COLLE, SHEARY and SUCTION.)

ACID IN PAINT.

Acid in paint, even if present in minute quantities, is seriously prejudicial on account of the solvent action which it is liable to exert on the pigments in the paint. In the case of paint which is to be used on a metallic surface the presence of acid is particularly objectionable. All paint which is of a protective nature should be tested before use for the presence of acid. Manufacturers frequently take precautions against the presence or generation of free acid in their paint by introducing a proportion of an alkaline carbonate, such as calcium carbonate (Paris white or whiting).

Acid is frequently introduced inadvertently into paint through the use of patent driers, which may contain large quantities of free acid. Certain commercial oxides of iron which have been prepared by the roasting of green vitriol or pyrites are contaminated with free acid, and even linseed oil sometimes contains excessive traces of free fatty acid.

Acid in paint is liable under certain conditions to promote livering of the paint. (See LIVERING.)

ACID IN WALLS.

The expression "acid in walls" is sometimes used in a loose and unscientific manner by painters in order to indicate that the wall which they are treating contains chemical matter of an active nature.

In point of fact such active chemical matter is most frequently alkaline and not acid in nature. At the same time cases occur in which wall surfaces are really acid, and if this is found to be the case a special preparatory treatment either with an alkaline wash or with a specially prepared paint containing an alkaline carbonate should be adopted.

ADULTERATION OF LINSEED OIL.

Considerable care should be exercised in the selection and purchase of linseed oil as a number of factors have contributed to a tendency towards this material in its commercial form being often somewhat unsatisfactory. The usual adulterants of linseed oil are mineral or rosin oil and cheap vegetable oils. The presence of the former causes paint to "sweat," and also destroys the drying properties to a greater or less extent. The presence of vegetable oils such as cotton oil, maize oil or soya bean oil also injures the drying properties, and frequently causes the paint to turn soft.

ADULTERATION OF PAINT.

The term adulteration is not always one of reproach, because it is common knowledge that certain of the lower priced paints must necessarily contain cheaper ingredients than those for which higher prices are paid. But whenever cheapening material is introduced into paints or pigments with fraudulent intent then the expression adulteration becomes one of reproach. A discussion of the various methods adopted to adulterate pigments and paint would occupy too much space, but certain brief notes on the subject are given under the paragraphs devoted to the chief ingredients of paints.

Adulteration of Red Lead.

There is ground for the belief that the term red lead should be held to apply only to commercially pure oxide of lead conforming generally to the formula Pb_3O_4, or, as it is now written, $2PbO,PbO_2$. Some authorities, however, maintain that the description red lead need only apply to that material when the word "genuine" is prefixed. Consequently they allege that "genuine red lead" and "red lead," may mean two different things. With this view the present writer does not agree, although it may have a certain weight of trade usage at its back. Adulterated qualities of red lead should always be sold as "reduced red lead." The materials generally used in adulterating red lead are ground glass (or "cullet," as it is sometimes called in the trade), barytes and very cheap mineral matter stained to a red colour with eosin. Sometimes the proportion of red lead in adulterated grades is as low as 10%, and the writer has examined samples of so-called red lead which were quite innocent of any red lead at all.

Inasmuch as the value of red lead depends on its binding and oxidising properties the presence of all adulterants is to be deprecated, and the only thing which might be held to excuse the presence of adulterants is the necessity on certain occasions to introduce inert material in order to keep the active chemical properties of red lead under control.

Adulteration of Turpentine.

Very little of the American spirit of turpentine sold in commerce is purposely adulterated. Nevertheless, owing to new methods having been adopted in the manufacture of the article American turpentine

varies much more largely at the present time than it did ten or fifteen years ago. To what extent American turpentine can, without detriment to its special properties, be blended with suitably prepared light mineral spirit is a much debated question, but if such spirits are used their presence should be declared, and it is not right to sell as "turpentine" any material or mixture of materials which is not wholly derived from the distillation of products of the pine tree. (See WHITE SPIRIT.)

ADULTERATION OF WHITE LEAD.

White lead is sold in the paint trade both in paste and as mixed paint. The adulteration of white lead is a matter which interests the painter greatly, and has been the subject of legal proceedings on numerous occasions. As the law at present stands, the term "white lead" cannot be applied to mixtures of white lead and other pigments. (See REDUCED WHITE LEAD.)

The presence of large quantities of adulterants in white lead paint causes the latter to lose opacity. It is not safe for a painter at once to conclude that adulterants are present simply because the white lead he is using may appear deficient in hiding power, because individual samples of white lead vary materially in the degree to which they possess the property of opacity. It is always difficult to determine the precise point at which a legitimate blending of pigments merges into gross adulteration, but it is usual to describe as "white lead paints" those in which at least 50% of the pigmentary matter is in the form of white lead. If the proportion of white lead falls below 50% of the total pigmentary material, then they ought not to be described by a name which

conveys the implication that white lead is the preponderating ingredient.

Age of Oil Varnish.

Oil varnishes require to be aged before being used, and a varnish even if made from the best materials and entirely satisfactory in all other respects is liable to grave defects if used in an immature condition. The "body" or viscosity of varnishes improves materially with age as also do the wearing properties of good quality varnishes such as body, carriage, copal and the like. Characteristic features of imperfectly aged varnishes are lack of brightness, want of body, too great fluidity in application, lack of toughness in the film, and a tendency to lose lustre.

Age of White Lead.

White lead after being ground with refined linseed oil to form ground white lead ought to be aged for several months before being used, and the product increases in value materially if this is done. Ground white lead which is too new is "short" and granular in texture, and when mixed with oil and turpentine does not produce such an opaque or easy-working paint as that produced from aged lead. Painters are sometimes less careful in regard to this matter than they used to be, and owing to the amount of capital locked up manufacturers keep their white lead in stock for as short a time as possible.

Alive, Keeping Paint.

Paint, varnish or distemper must not be worked with the brush after it has begun to "set." Up to

this point it is said to be "alive" and contiguous "stretches" can be "joined up" without showing marks and blemishes. In laying off paint, enamel or varnish there is an art in knowing how long to continue to work the material. The danger of the edges showing is aggravated when the surface is porous.

ALKALI IN WALLS.

This is one of the most frequent sources of trouble which the painter experiences, and is chiefly due to the presence of uncombined hydrate of lime or basic lime salts in the wall. Under normal conditions hydrate of lime (slacked lime) is ultimately transformed into carbonate of lime, in which condition it loses its alkalinity. Many quick setting and "patent" plasters contain large quantities of soluble lime salts of a strongly alkaline nature which appear on the surface as an efflorescence (See EFFLORESCENCE.)

Time is the most effective cure for such difficulties, but when work has to be done in a hurry the surface may sometimes be rendered more suitable for the application of paint by very carefully washing down with an acid wash (a weak solution of acetic acid or vinegar may be used) in order to neutralize the surface alkali. Sometimes it is best to apply several coats of a reliable water paint, which acts as a sponge and absorbs the salts exuded from the wall and prevents their striking through into the paint or other decorative material.

The chief reason for the serious defects arising from the presence of alkaline matter is that it saponifies linseed oil. Consequently the oil in a paint applied to an alkaline surface will be turned more or less completely into a soap, which will probably never dry but will form a soft, pulpy or greasy patch on the wall

Alkali Left on Walls After Washing.

Sometimes the alkaline matter on walls is due to causes which can be controlled by the painter. It is a common practice in "stripping" or cleaning down walls to use a solution of caustic alkali or strong carbonate of soda or to utilise one of the numerous alkaline paint solvents. When these materials are employed the greatest care should be taken to wash down the surface afterwards with clean hot water, and in certain cases it may even be necessary to introduce some weak acid into the washing water in order to neutralize traces of alkali which may have been left. Should the latter procedure be necessary great care must be taken that acid is not finally left on the surface.

Alligatoring of Paint.

The term alligatoring as applied to paint is an American one and has crept into use in popular paint literature. It is a descriptive term used to describe the appearance presented by a paint, varnish or enamel film when it has become cracked in such a way as to resemble the markings on an alligator's back. Unfortunately, the same term is also used to describe a particular variety of wrinkling or ridging, and as there is a sufficiency of English words available to describe either phenomenon it would appear to be desirable to eliminate the term "alligatoring," which is by no means a suggestive term to people who rarely see alligators.

Alum in Distemper.

Alum is not infrequently introduced into distemper for the double purpose of hardening the size

and rendering it more or less insoluble when on the wall, and of preserving the distemper. If not present in excess it has no bad properties, but being an acid material the proportion in which it is introduced should be properly gauged.

ALUM IN PAPER-HANGERS' PASTE.

Alum is introduced into paper-hangers' paste for two reasons, (1) owing to its action as a preservative ; (2) in order to assist the paper to contract during drying and so to present a tight smooth surface. It is, however, a dangerous ingredient on account of the action which it exerts on many colouring materials, particularly certain of the fugitive pigments and dyes used in staining and printing wall papers. The action of alum is particularly severe on many of the cheap soluble dyes used in the fabrication of ingrain papers in connection with which the purest and best flour paste should be used. (See INGRAIN PAPERS.)

AZO-REDS.

A class of bright chemical red pigments used as substitutes for vermilion and described as "signal red" "Post Office red," permanent red, etc. For particulars as to their composition, properties and examination reference should be made to the books of specialists.

B

Badly Ground Paint.

There is a certain somewhat arbitrary standard in relation to the fineness of grinding of paints, and if this standard is not reached the paint is said to be badly ground. All that one can say in this connection is that the material must be reasonably well ground, due regard being had (1) to the price the buyer pays for it, (2) to the purpose for which it is required. Thus for example the contents of a tube of artist's colour would not be considered well ground unless the fineness was considerably greater than is found in the cases of, say, Brunswick green paint as used by a house painter. If the best grades of house painter's paints are in question a rough and ready but quite practical way of determining whether they are sufficiently well ground is to thin a small quantity of the paint with turpentine, and to paint a perfectly smooth surface with this flat paint and then to varnish it. If the surface so produced looks so gritty that no reasonable practical man would pass work finished in this way, then the paint may safely be condemned as badly ground. Painters should not forget, however, that repeated grinding of paint during manufacture in order to remove the last trace of grit seriously increases the manufacturing cost, and consequently they cannot expect the same degree of finish in cheap paints that may reasonably be demanded in the case of higher priced materials.

Fine grinding is very important in the case of staining colours, because the strength and intrinsic value of the colour in actual use depends very largely on its fineness, and a finely ground stainer will go much further in use than a badly ground one. It is the worst of bad policy to purchase cheap and badly finished staining colours.

BARYTES IN PAINT.

Excessive quantities of barytes are objectionable in paint as they make the paint gritty and sandy in texture and reduce the opacity. Barytes also has the property of sinking to the bottom of the paint pot or can very readily, and paint that contains much barytes will, if left for some time, separate into two distinct layers. In other words, the material ceases to be paint at all.

In purchasing very cheap grades of ground colours painters are frequently purchasing an excess of barytes without being aware of it, and are paying excessive prices for rubbish. Mixed paint containing such adulterated material will exhibit all the defects referred to above. "Patent driers" also contain large proportions of barytes, and this is one of the arguments against the use of these materials. Nevertheless, barytes possesses certain valuable properties. It is extremely permanent. Used with discrimination and in suitable proportion along with other pigments, barytes is a useful member of the list of raw materials which the expert paint maker can draw from.

BATHS, PAINT OR ENAMEL PEELING OFF.

This is usually due to lack of adhesion between the metallic surface of the bath and the *first coat* of paint

applied to it. Painters are aware that special enamels and paints should be used for the finishing coats of baths in order that they may withstand the action of hot and cold water, soap, etc. Too little attention is frequently given to the fact that owing to the expansion and contraction of the metal *ordinary* flat paint should not be employed for the first or priming coat. The best results are obtained by applying as priming coats specially prepared hard-drying semi-flat enamel paints similar to those which would be employed in engine painting. If proper attention is given to the priming and to ensuring that the surface of each coat is neither too soft nor too hard before the next coat is applied there is little danger of the final coats peeling off.

"Best" as Applied to White Lead, Red Lead and Paints.

The word "best" is a relic of old trade usage in the paint trade, and paradoxical as it may appear has come to be employed to describe an article of second quality. Thus, in the old days before Chambers of Commerce and Trade Protection Authorities became alive to the necessity for protecting the buyer against the unscrupulous maker or dealer, "best" white lead described a quality of ground white lead which was certainly not genuine, but contained from 15 to 20 per cent. of adulterant, usually barytes. It cannot be said that the description is a satisfactory one, and nowadays it carries no weight.

"Bits" in Mixed Paints.

Paint is said to contain "bits" or to be "bitty" when small pieces of skin or minute lumps of undivided pigment are found throughout the bulk. It

is a most annoying defect, and paint so affected should be strained to the last drop, in order to remove the suspended "bits." The presence of "bits" is frequently due to carelessness or improper handling of the paint prior to, or during, mixing. For example the stiff paint which is to be used as the base of a certain mixed paint may have become skinned over in the stock cask and the paint mixer may have omitted to remove the layer of skin before placing the colour in the mixing vessel. The result will be that minute pieces of skin will become beaten out and distributed throughout the bulk, and unless the paint is carefully strained no painter can use such material satisfactorily. In cases where the bits consist of small lumps of solid pigment they are usually due to the stiff paint having been in too dry a condition and consequently having escaped proper admixture with the thinners in the process of mixing. These defects are clearly due to materials, and the attention of the persons supplying them should be drawn to the matter before the paint is used.

BLACKENING OF WHITE LEAD.

It is a well-known fact that white lead paint rapidly becomes discoloured when exposed to air contaminated with compounds which contain sulphur. In London and other large cities the outside of buildings painted with white or light tinted lead paints rapidly assume a drab or brown appearance owing to the formation over the whole surface of particles of sulphide of lead, a material which possesses a metallic black colour. It is for this reason that white lead has been rejected as a satisfactory pigment for use in situations exposed to sulphurous gases. As might be expected the flatter the surface is the more rapidly

the blackening effect occurs, owing, of course, to the absence of any protection in the form of oil or varnish, which envelop the pigment and protect it against the gases in the air.

Black Metallic Spots on White Lead Paint.

A very curious and unsightly effect is produced under certain conditions through the action of the air in towns acting on exterior white lead painted work. The effect referred to consists in the formation over the surface of metallic spots, streaks or splashes of a metallic black appearance. Investigation has shown that these spots are due to the formation on the surface of sulphide of lead, and they appear to be formed by particles of soot or smoke (in the form of fog) settling on the white lead surface. Two conditions appear to be necessary for the production of the phenomenon :—

1. A solid particle containing sulphur (this being provided by the solid particles of soot contained in fog.)

2. A soluble lead compound on the surface. The latter condition may be due to one or other of several causes :—

(*a*) The presence in the white lead of soluble basic acetate of lead.

(*b*) Traces of lead soap resulting from the saponification of a portion of the oil by alkali left on the walls after washing down.

(*c*) Soluble compounds of lead formed by the solvent action of traces of acid either derived from patent driers or present in the air. It is always found that the phenomenon is confined to surfaces which have been finished with a more or less flat surface and is particularly common in

cases where only one coat or at most two coats have been applied. Certain makes of lead seem to be more prone to produce the phenomenon than others, and it is only during the last four or five years that the trouble has become at all common.

"BLEEDING" OF REDS.

The expression "bleeding" is applied to the phenomenon met with in certain lake colours whereby they become more or less soluble and permeate films of paint above them with a red or pink colour. Certain classes of lakes are particularly prone to this defect, and it is wise in selecting red lakes, particularly those possessing crimson and purple tones, to ensure that they are recommended as being free from the defect. It is almost impossible to obscure satisfactorily a red surface composed of a red which bleeds, and the only practical way to prepare such a surface or painting is to cover it with a spirit varnish which will seal up the surface. Special varnishes are manufactured for this purpose, and pure shellac varnishes made rather thin may be used on occasion. It is noteworthy that bleeding is more noticeable when white lead is mixed with or applied over a pigment liable to the defect than when oxide of zinc paint is employed. As a general rule white or red lead should not be used as a ground for lake colours, nor should white lead be mixed with them. Bleeding is often particularly noticeable over knots in wood owing to the chemical action promoted by the rosin acids.

BLISTERING OF PAINT.

This is invariably due to lack of adhesion between

one or more of the paint films and the paint beneath, or between one or more of the paint films and the original surface. In the former case the blistering may be due to the under-coats being too hard and thereby providing no key for the paint above, or to the surface having contained a trace of moisture. The blisters themselves are due to the generation of some gas, usually aqueous vapour, but also sometimes carbonic acid gas. If the latter is the case (as it may be if white lead is present) the trouble is traceable to the carbonate of lead having become acted upon by some acid material either in or beneath the paint. For example, a resinous exudation from the wood may set up chemical action in the pigment. The risk of blistering is aggravated if the paint is applied too thickly or is too oily in composition. Thorough brushing out and working up from a comparatively flat coat through successive coats to a more elastic coat as a finish are the best ways to avoid this trouble. On bare woodwork a coat of good water paint applied before painting and allowed to dry hard often proves an effective preventive of blistering.

Blistering of Varnish.

It is very seldom that varnish blisters of itself. Blistering of a varnish surface is usually due to blistering in the paint beneath the varnish. (See last paragraph.)

Blooming of Varnish.

A whole treatise might be written on this subject, but it is a rule of almost universal application that the effect known as "blooming" is associated with the absorption of moisture by the surface, and it is the presence of this moisture which produces the optical

effect which is so unsightly and erratic in its appearance. Local conditions as to temperature, humidity, etc., affect the tendency to bloom, and the best way to avoid the defect is to ensure that the varnishing is carried out under proper conditions as to weather and temperature, and that uniformity of temperature and good ventilation are maintained during the process of drying. Fumes from gas stoves and bad or stagnant air generally are fertile sources of blooming. If the case is not a very bad one, polishing the surface with a thoroughly dry chamois leather sometimes effects a cure. Rubbing the surface over with strong acetic acid and afterwards polishing with a clean leather is also beneficial in some cases. Sometimes, however, even if the bloom is temporarily removed it comes back again, and in extreme cases revarnishing the surface under thoroughly good conditions will not effect a cure. The composition of the varnish may be the fundamental cause of blooming. Thus the presence of rosin induces a tendency to bloom owing probably to the greater tenacity with which moisture is held by a soft resin like rosin. But blooming does not necessarily prove that the varnish is defective. The effects known as "clouding" and "fogging" are akin to blooming, and are often the incipient stages of that defect.

BLUEING OF PAINT.

A curious effect is met with sometimes in the case of gloss paints containing Prussian blue as a preponderating ingredient, viz., the generation of white or blue spots on the surface. When the paint dries again the spots often disappear. A precisely similar effect is noticeable in the case of varnishes applied over dark Brunswick green or Prussian blue grounds. The cause is local absorption of moisture by the surface

which produces a kind of local fog or bloom. When the paint or varnish has finally dried hard it no longer shows the marks in the same way. The defect is usually found in cases where the paint or varnish has been applied in humid weather and has taken somewhat too long to set. During the setting process the film appears to develop a tenderness which induces local absorption of moisture under certain conditions.

Body, Absence of.

The term "body" is often applied in a somewhat vague way. In the case of varnish, it is usually synonymous with viscosity. When applied to paint, the term "body" may mean either the thickness or viscosity of the paint or its obscuring power. (See Opacity.) Lack of proper body in varnish prevents a sufficiently thick coat being applied, and the surface is therefore liable to lose lustre and durability. When paint is in question the absence of sufficient opacity or obscuring power necessitates the use of an abnormal number of coats. Painters often complain of lack of body in their paint or varnish somewhat unreasonably. The hand and eye readily get accustomed to a particular degree of viscosity, and the use of another paint or varnish may be uncongenial to the workman for a little time until he becomes accustomed to the new material. Complaints of this nature, therefore, should be rigidly examined, as only by practical experience is it possible to tell whether the paint or varnish in question possesses sufficient viscosity or thickness for the purpose in view.

Brightness.

The brightness of pigments and paints is a physical

property which is sometimes of great importance. It is also described by the term "fire." Thus, for example, in such pigments as vermilion, emerald green, Prussian blue, the chromes and some lake pigments, the brightness or fire of the pigment determines in many cases the utility of the pigment for a certain purpose. Modern colour making resorts to many expedients to communicate to pigments a fictitious brightness which rapidly disappears. This can usually be tested before the pigment is brought into use.

BRIGHTNESS, LOSS OF, IN PAINTS.

This may be due to the pigment failing to retain its "fire" in presence of a vehicle, or it may be due to the action of light bleaching the pigment. For example, a paint tinted with rose pink or Dutch pink will rapidly lose its characteristic tone of colour or brightness when exposed to light Loss of brightness in paint indicates that deterioration or chemical change of some sort is going on. Considerable skill and experience may be required in order to establish the true cause of the change.

BRIGHTNESS OF VARNISH.

When applied to varnish the term brightness may be synonymous with lustre, or it may refer to the degree of transparency in the varnish, and this is the sense in which it is commonly used, a "star bright" varnish being one which is perfectly transparent and free from every trace of cloudy matter. Loss of brightness or transparency *in varnish* is usually due to the precipitations in the varnish itself of small particles of solid matter, and the phenomenon points

to imperfectly matured varnish or to one containing an excess of drier. Such varnish should always be rejected. Loss of brightness or lustre *in a varnish film* is due to causes which will be dealt with in other paragraphs.

Brightness of Oils and Turpentine.

All oils and turpentine used in paint should be perfectly free from suspended matter. The presence of minute particles gives rise to the effect described as "cloudiness." Oil or turpentine may be or may become cloudy through the presence of traces of moisture, but in any case cloudiness points to defective material, and if it does not disappear when the material has been kept for a little time in a warm place the quality of the oil or turpentine should be carefully enquired into.

Brittleness in Spirit Varnishes.

Owing to the nature of these materials a certain amount of brittleness is inevitable. The drying of spirit varnish is due to the evaporation of volatile solvent which leaves the gum or resin in the form of a thin film which in course of time is extremely liable to become brittle. That brittleness can be modified n spirit varnishes is apparent from the fact that properly made and applied French polish does not present a brittle surface. But, on the other hand, it must be remembered that French polish is applied in a special manner in films of almost infinitesimal thickness, and the whole mass of polish becomes in effect a part of the wood, the preparation of which to receive the polish is also a matter of the greatest practical importance.

BRITTLENESS IN VARNISH AND ENAMEL.

Excessive brittleness, or in other words lack of elasticity, in varnish or enamel is a serious defect and is one that can be justly attributed to the material. In the case of varnishes skill and experience are necessary in order to select a material the elasticity of which is exactly suitable to the nature of the ground on which it is applied. Thus too elastic a varnish on a hard non-elastic surface will give just as bad results as too hard or brittle a varnish would give. Excessive brittleness in varnish is manifested by premature cracking, which takes place in the form of numerous fine hair cracks or fissures developing in all directions. The varnish can also be easily scratched off in a powdery form by the nail. Tendency to brittleness in varnish can easily be tested by applying a thin film of the varnish on a piece of glass and testing it with the nail during and after drying Brittleness in enamel is generally akin to brittleness in varnish and is an equally fatal defect. Many of the older enamels suffered seriously from this defect, which has been counteracted in the more modern materials. In the case of enamels the phenomenon of brittleness is complicated by reason of the introduction of pigments into a medium of the nature of varnish, and it is part of the business of the enamel manufacturer to see that the resulting product is neither too brittle nor too slow drying and elastic.

BRONZE TARNISHING.

So-called gold leaf and gold powders or gold bronzes are liable to tarnish in the open air owing to the tarnishing of the copper contained in the alloy. Tarnishing may consist merely in a slight dulling of

the surface with the generation of a reddish tint, or the surface may rapidly darken and become ultimately almost black. In presence of sea air or sea water tarnishing proceeds very rapidly, and under such conditions pure gold leaf is also affected. Bronze powders are unsatisfactory as a substitute for gold leaf out-of-doors, but in cases where they are used the surface should be protected by a suitable varnish. All bronze paints tend to lose their lustre after being kept in contact with the liquid medium. The latter should always be free from acid and should be mixed with the powder immediately before use.

Brunswick Green Turning White.

This may be due to the causes described under "Blueing of paint," but may also be due to an entirely different cause, viz., the chemical reaction between the Prussian blue and the chrome yellow contained in the Brunswick green. The effect is usually found in Brunswick greens of low quality. Chrome yellow, particularly if it is slightly basic in character, slowly destroys Prussian blue, while Prussian blue acts as a slow reducing agent on chromate of lead. Hence on strictly scientific principles chromate of lead and Prussian blue ought not to be mixed together. In practice, however, the mixture can be carried out with comparative safety, but it is wise to purchase Brunswick greens, whether in the form of paint or enamel, from manufacturers of repute rather than to mix them haphazard in the paint shop.

Brushes.

Complaints regarding brushes are numerous, one of the chief being, of course, that the bristles come

out. This is frequently due to the brush having been improperly prepared before use. For example, a distemper brush and indeed many other kinds of brushes as well, should be soaked in water before being used. Brushes which are intended for the application of paint, enamel or varnish should be brought into use by soaking in linseed oil. The soaking, whether in water or oil, is intended to swell the binding and so prevent the bristles coming out under the drag put upon them when in use. Defective brushes, in spite of all care that may be taken of them, are liable to shed their bristles, and scrupulous care should therefore be taken in the selection of brushes. Well-trained painters are taught during their apprenticeship not only the proper mode of bringing a brush into use, but also how to take care of it during its life. Varnish and enamel brushes and tools well repay all the attention that can be given to them, and for any important work a thoroughly broken in and reliable brush should always be used. Twisting of the bristles is a defect due to want of care in "setting" them in the stocks. It is met with in sash tools and "knot" brushes. Brushes which are in use should never be allowed to rest on the tips of the bristles, but should be suspended in a tin of oil or varnish as the case may be.

BRUSHES, CLEANING OF.

Brushes should always be cleaned out immediately after use, otherwise paint or varnish will accumulate at the end of the bristles near the stock and will leak out when the brush is again used. If this paint or varnish is allowed to become hard, small particles (see NIBS and SPECKS) will be brought down into the working part of the brush and thence on to the work,

giving rise to a rough unsightly appearance, the cause of which is frequently assigned to the paint or varnish itself.

Brush Marks in Distemper Work.

On account of the nature of the surface and the nature of the materials used in distemper work brush marks are sometimes rather prominent, although a good workman can nearly always be depended upon to avoid them. The use of cheap distemper brushes containing fibre is liable to produce brush marks, and it sometimes happens that the surface is so porous that the material sinks in too quickly to enable it to be "laid off" properly. It frequently happens that on "hot" or very porous surfaces brush marks are specially obvious. Stippling is a simple and effective treatment in order to prevent brush marks showing and is applicable to all flat or semi-flat materials.

Brush Marks in Enamel Work.

The proper application of enamel is one which calls for high skill on the part of the painter, and three things are essential: 1. A properly prepared surface. 2. A properly selected and well broken-in brush. 3. A good enamel. Any defect in either of the three above mentioned essentials will result in unsatisfactory results of some kind, and these may include brush marks. The presence of brush marks, therefore, in enamel work always requires careful investigation, as they may be due either to lack of skill or experience on the part of the craftsman or to unsatisfactory material supplied by the manufacturer.

BRUSH MARKS IN PAINT WORK.

This is clearly a defect due to lack of skill on the part of the workman, but it may be accentuated by the use of coarse, cheap or imperfectly broken-in brushes. (See ROPINESS).

BRUSHES, SUBSTITUTES FOR BRISTLES IN.

The chief substitutes for real bristle, which is the natural product obtained from the wild hog, are horse-hair and fibre. There is a great temptation to reduce the cost of large brushes by the introduction of these substitutes. From the point of view of real efficiency and economy (always provided proper care is taken of the brush when in use) nothing equals a genuine bristle brush, but some workmen are so careless that unless they are supervised there is a risk of considerable loss through wastage in brushes, and consequently many master painters prefer to purchase a cheaper brush with a shorter life so that the loss incidental to each brush is reduced. In distemper brushes only a small proportion of hair should be permitted, as brushes containing hair lose their elasticity and spring, and splashing and brush marks are the result. If a distemper brush has to be cheapened it is probably advisable to do so by the introduction of suitably adjusted quantities of fibre and hair mixed. The pure hair brush is seldom satisfactory. For the very commonest class of lime-washing and distempering a fibre brush is preferable to a hair brush.

BUFF.

In addition to the use of this word to denote a particular shade of colour it is also employed in a

technical sense by painters to indicate the surface on which oak graining colour is applied, the reason being that the surface in question is usually of a buff hue. The preparation of the "buff" or ground for graining is of immense importance. Unless it is of a suitable hardness and possesses just the necessary amount of "key" for the graining colour, cissing, cracking and other faults will occur.

C

CARE OF BRUSHES.

This is such an important point that every properly qualified painter is taught from his apprenticeship upwards to be scrupulously careful in the keeping of his brushes. Slovenly painters and amateur users of paint usually do not sufficiently realise the importance of taking care of brushes, *i.e.*, the keeping of them in a clean condition and suspended with the bristles downwards in a suitable medium (*e.g.*, oil or varnish according to the use of the brush) and in such a way that the bristles do not touch the bottom of the vessel. (See BRUSHES).

CARE OF STOCK.

Everyone knows how liable stocks of materials are to deteriorate. Deterioration may be due to some inherent property of the materials themselves, such as liability to decompose (*e.g.*, size, paste, and other organic materials). Deterioration also takes place through the material becoming damp, *e.g.*, whiting, oxide of zinc, etc. Again deterioration and loss of value may occur through the stock becoming contaminated with foreign matter such as soot, sand and rubbish of any kind. Many defects in painters' work can be directly traceable to the use of materials which have become deteriorated either through careless storing or through the material having lost some of its virtue through age.

Caustic,
(see Alkali).

Ceilings, Stained.

Stains frequently come through distempered, papered or even painted ceilings owing to soot and dust from the grouting above coming through the plaster. They may be due also to moisture in the grouting or moisture derived from a damp wall or defective brick having penetrated into the ceiling and having dissolved traces of iron salts which make their presence known by stains. In dealing with such stains it is advisable first of all to determine if possible their nature and origin, as the mode of treatment must necessarily depend on these factors. Papering followed by distemper or good water paint or the use of a hard spirit varnish containing shellac are expedients frequently adopted to keep back stains.

Chalking.

The term is applied to the disintegration of a painted surface in such a way that the particles of pigment are separated in the form of fine powder. White lead is particularly liable to chalk, but no pigment is entirely exempt from this tendency. The defect is due to the destruction of the oil or other binding medium which holds the pigment together, and is an entirely different mode of destruction to that known as "flaking" or "scaling." Unmatured lead is more likely to chalk than aged lead, and the tendency is aggravated by the use of too little oil or too much drier or turpentine in thinning the paint. Chalking is particularly liable to occur in situations where

linseed oil is destroyed most readily, for example, in situations exposed to sea air. The best way to avoid the trouble is to ensure that a sufficiency of oily medium and as little as possible of spirituous medium are employed in the thinning of the paint. The addition of a suitable proportion of elastic varnish medium also reduces the liability to chalk. Unsuitable driers and excess of driers also promote chalking.

CHECKING.

This term is borrowed from American paint terminology and is applied to a particular kind of cracking, viz., the formation of fissures in all directions, leaving isolated parts of the paint or varnish of irregular shape between the fissures. The appearance of the phenomenon points to the paint or varnish lacking elasticity, and it may occur long before the surface begins to disintegrate, although it is a forerunner of the latter. Certain mixtures of pigment are more liable to induce checking than others. (See FISSURING).

CHEMICAL ACTION.

A treatise might be written under this head alone, but from the point of view of investigating faults or defects it will be sufficient to differentiate in the present instance between :—

1. Chemical action between the ingredients of the material used.
2. Chemical action between the surface on which the material has been applied and one or other of the ingredients of the material.
3. Chemical action between the atmosphere and the outer surface of the paint, varnish, etc.

Considerable skill and experience are often necessary in order to isolate the cause and effect of chemical action in or on a painted surface, and the matters which fall within this head soon become so complicated that the services of a paint expert and chemist may have to be invoked.

Chilling.

Chilling is the term applied to the effect produced on a varnished surface which has been exposed to a draught of cold air during the setting or drying of the varnish whereby it acquires a non-lustrous opaque appearance. The precise effect depends on the local conditions and may consist of a dull appearance over the whole surface or in extreme cases a rough granular surface due to the deposition of minute particles of resin. Some varnishes are more liable to chill and are much more "tender" than others, and care should be exercised in the selection of varnish for use in situations where cold currents of air may be looked for during the process of drying.

Cissing.

Varnish, enamel or paint may ciss, but the term is more usually applied in connection with varnish. It means the pulling up of the varnish immediately after application in circular patches or blobs. This defect is due to surface tension and capillary action, and is met with when the surface on which the varnish is applied does not present the requisite key, as for example when it is too oily or too impervious. It is for this reason that the surface which has to be varnished should be carefully watched in order that the varnishing may be carried out at the proper

moment. In order to prevent cissing expert varnishers are in the habit of "damping down" the work either with water or with a mixture of water and whiting. Polishing down with pumice stone and water is also adopted when repeated coats of varnish have to be applied one over the other. Paint and enamel exhibit the phenomenon in a precisely similar way but in a less degree than varnish on account of the superior adhesive properties possessed by them on account of the presence of pigment. Varnish or enamel applied to a glossy surface is especially liable to ciss.

CLAIRE COLLE.

Literally means liquid glue, or "size" as we should say. The term is often mis-spelt Clere-col, Clere-cole or Cler-col. The modern size or "patent" size as used by the painter is too often a cheap disgusting preparation very ineffective in its action and woefully insanitary.

CLIMATE, EFFECTS OF.

The term "climate" may be expressed as the sum total within a given period of successive changes of temperature and humidity, and all painted or varnished work is liable to the effects of the climate to which it is exposed. It has been found that successive changes from hot to cold and then from cold to hot and from damp to dry and from dry to damp are much more likely to cause destruction to paint and varnish than exposure to a climate in which these agencies do not vary within wide extremes. Thus a paint or varnish exposed to a high temperature or to a cold temperature respectively will not as a rule show the same deterioration within the same lapse of time as paint or varnish

exposed successively to extremes of heat and cold or dry and wet. This has been found to be the case in India where railway carriages running from the plains to high altitudes always exhibit quicker destruction of the paint and varnish than is found on coaches whose duty is confined either to the high altitudes or to the plains. In Russia also galvanised iron roofs which have been painted as a rule soon show signs of deterioration in the paint owing to the wide ranges of temperature which they are called upon to stand.

Clouding of Varnish.
(See Blooming).

Cold, Effect of.

Continuance of cold during the period of drying of varnish may have the effect of preventing it from drying altogether. In such cases the drying is said to be "strangled" and as a general rule there is no practical course open in such cases but to wash off with turpentine and re-varnish. The expedient of brushing over the surface with a thin quick varnish is only an expedient to get over a job quickly and should not be adopted when good work is in question. (See also "Chilling.")

Colour Fading.
(See Fading of Colour).

Condensation.

Condensation of moisture on a surface is liable to produce many defects which in some cases are extremely complex and difficult to investigate. The condensation may not be manifest to the eye or

to the touch, but many cases have been met with, especially on exterior work, where condensation of moisture has caused flaking of the paint from the surface. Condensation of moisture on a paint, varnish or enamel film also gives rise to curious results. It may for example delay the drying, with the result that the work remains tacky or may even fail to dry at all. It may also cause blooming, and when aggravated by the presence of stagnant or foul air it may have the effect of decomposing the surface film with the result that drops of sticky gummy matter are exuded from the surface. (See VENTILATION.)

COPPER TARNISHING.

Copper readily tarnishes in the open air, owing to the formation on the surface of an oxide of the metal. Chemical fumes also readily affect copper, while sea air, on account of the presence of chlorides, is particularly liable to cause tarnishing. Bronze powders which contain a considerable proportion of copper, follow the same rule, and they are therefore inapplicable for exterior work or even for interior work unless the surface be protected by varnish or lacquer.

CORROSION.

In order to prevent ambiguity and the use of terms in a vague unsatisfactory way the expression "corrosion" should be limited to describe the oxidation on a metallic surface. Rusting (see RUSTING) is a species of corrosion and the most common, but the oxidation of any metallic surface may properly be described as corrosion. In engineering painting it is of fundamental importance that the metallic surface should be freed before painting from every trace of

rust, and furthermore that the surface be brought to a uniform level bearing by means of a suitable filler before the painting process proper is begun. Corrosion may proceed underneath a paint film, and frequently does so, and evidences of this are found on the surface of the paint in the form of small red or brown stains which rapidly form blisters and come through the paint as rust spots. If the paint on and around such rust blisters is scraped away a minute rust "crater" or rust "volcano" (to adopt picturesque titles borrowed from American paint terminology) will be discovered. (See Iron, Painting of.)

Covering Power.

This expression is used in entirely different senses :—

1. As synonymous with spreading power, which indicates the area covered by a given weight or volume of paint material. It would be beneficial if the use of the expression "covering power" in this sense were discontinued and the term "spreading power" universally adopted in its place. (See Spreading Power.)

2. As equivalent to "opacity," which is also described by the more unsatisfactory term "body" (see Body). Another word employed in this sense is "hiding power," but the term "opacity" is probably more satisfactory (see Opacity).

Cracking.

Cracking may occur in a variety of ways and may be due to many causes. Paint, varnish or enamel films which exhibit cracks have evidently lacked tensile strength. A physical consideration of such films indicates that unless the surface pull or tension is

equal at all points in all directions the film will separate either at one point or at a series of contiguous points. If the series of contiguous points form roughly a straight line, then fissuring is the result, if at one point pin-holing occurs. Cracking is frequently an indication of the first stage of the destruction of a paint or varnish film, and it all depends on the time during which the film has been exposed and the nature of the ground on which it is applied whether the defect can be deemed to be inherent in the materials employed or is due to the natural and inevitable destruction of the film which must come about after a certain lapse of time. (See CHECKING, FISSURING, PIN-HOLING).

CRACKING OF ENAMEL.

The production of fine hair cracks in enamel indicates the commencement of deterioration and destruction of the material and is usually caused by the enamel containing too much hard setting material of the nature of varnish. The earlier enamels were particularly prone to this fault owing to their mode of manufacture, but the modern enamels exhibit a tendency to crack much more rarely. The important rule to observe in order to avoid cracking in the finishing coat is to ensure the proper degree of elasticity in the coats below. No two consecutive coats, whether of paint or enamel, should, as a rule, possess precisely the same composition and degree of hardness. Thus, the under coat for a glossy finish should be more or less flat, and *vice versa*.

CRACKING OF GRAINING.

As a rule graining cracks on account of the graining colour lacking elasticity or because it has not been

modified to suit the ground. If the ground is too oily the application of the graining colour may soften the ground, and unequal expansion and contraction as between the colour and the ground takes place. Cracking will also be induced if the varnish applied over the graining colour is too hard and non-elastic. The varnish then cracks and causes the graining below to crack with it.

Cracking of Paint.

May be due to many causes. Very often it is caused by the final coat being less elastic than the undercoat. Or, again, the last coat may have set too quickly or may have been applied before the previous coat was quite hard. Exposure to changes of temperature during drying also causes cracking, frequently accompanied by wrinkling or crocodiling. Cracking is often the first stage in the destruction of the paint, and paint that has cracked is no longer fulfilling its essential purposes, one of which is to exclude moisture.

Cracking of Varnish.

This is due in the main to causes similar to those which govern cracking in paints or enamels. The composition of the varnish has a great effect on the tendency to crack, those varnishes which contain the more brittle resins, such as rosin, dammar and the like being most liable to this defect. The rate of drying of the varnish also influences cracking, as does the nature and condition of the surface beneath. Provided there is no abnormal local cause likely to induce cracking the better class of varnish containing Zanzibar, Madagascar, hard Congo and Kauri resins

are much less liable to crack than varnishes made with the softer and cheaper resins. It is always well to remember that cracking is the first stage of general break down and destruction of a varnish film.

CRAWLING OF VARNISH.

By this name is described the effect produced when a varnish film becomes displaced on the surface before drying. It is a most unsightly defect and may be due to the varnish being applied in too thick a coat or to the surface on which it is applied presenting insufficient key. Bad drying conditions also promote crawling.

CRAZING.

This term is used in two distinct senses one indicating wrinkling or crocodiling, the other indicating cracking or fissuring. Tiles are said to 'craze' when cracks or fissures develop (owing as a rule to unequal expansion and contraction). As applied to paint or enamel the term is usually synonymous with crocodiling. (See CROCODILING).

CREEPING.

Implies that a newly painted or varnished surface moves downwards. The term is practically synonymous with crawling.

CREOSOTE, PAINTING ON.

Owing to the presence of tar acids no material which contains creosote can be successfully painted over. The greasy nature of creosote preparation

also prevents paint adhering to them. The modern wood-preservatives are of this nature. If painting is necessary it is best to wash the surface with white spirit, dry it as thoroughly as possible, and apply a coat of shellac varnish or knotting. The same process may be adopted before varnishing and for rough work a coat of good size may take the place of the knotting.

Crimping of Varnish.

In general this term is used in the same sense as crinkling, but is perhaps more properly confined to the phenomenon of crinkling when it occurs on the edges of the work.

Crinkling of Varnish.

The term "crinkling" is self-explanatory, and is used when a varnished surface assumes a ridged or, as it is popularly described, "crinkled" appearance. The defect may be due to causes similar to those producing crawling but may be inherent in the varnish itself, for example an excess of Chinese wood oil or the presence of Chinese wood oil improperly prepared or unskilfully amalgamated with the other ingredients, is a fruitful source of crinkling. Excess of driers also produces the defect.

Crocodiling of Paint.

When the surface of paint assumes a rough uneven appearance due to the formation of ridges on the surface it is said to crocodile, and the expression "crazing" is used to describe the same defect. Cracking or fissuring is not implied, but may follow as a

result. The defect is caused by the paint drying on the surface, which then contracts. Heavy coats of glossy paint or enamel applied on too hard or impervious a ground are very liable to give rise to the defect.

CRYSTALLISING.

A varnished or enamelled surface, but particularly the latter, may under certain somewhat obscure conditions present a surface which is precisely similar to that exhibited by a sheet of galvanised iron. No very satisfactory explanation of this phenomenon has been found, but it is probably due to the surface having been struck by a draught of cold air at a critical point in the drying. There is no cure for the defect but to rub down and apply another coat.

CULLET.

This is the name given to powdered glass which is sometimes introduced into red lead in order to produce cheap adulterated grades. The opacity of the glass is so low that a good deal can be added before the opacity of the red lead is seriously impaired.

CURDLING.

A hard drying varnish such as hard church oak sometimes assumes a gelatinous consistency in the can. This is usually due either to an excess of drier having been used in the making of the varnish or to some chemical action having taken place in the oil ingredients often through complex reactions with the drier. Such varnish should never be used. Oil may curdle in a somewhat similar way, as for example on

the addition of liquid driers to the oil. Driers which produce this defect should be rejected and the oil should also be subjected to examination in order to see whether it contains traces of objectionable oils (such as colza oil) which are liable to induce curdling. Paint may curdle after being mixed for somewhat similar reasons, but in this case the phenomenon is usually described as "thickening" or "feeding up."

Curtaining.

This term is usually employed to describe the effect produced when varnish after application falls down the surface in a series of sweeping layers. Curtaining may be due to the use of thin or badly matured varnish or it may be due to the application of too heavy a coat, or again it may be caused by the surface affording too little key. Almost any varnish or enamel in the hands of an unskilful workman or an amateur may present this defect, but if curtaining takes place when a qualified craftsman is using the materials it may be taken to point to unsuitable or badly prepared material.

D

DAMP COURSE, WANT OF.
(See DAMP WALLS.)

DAMP WALLS.

The defects and difficulties met with in painting work which are due to damp walls are legion. Sometimes the defect is due to the action of moisture pure and simple, but more usually the action is aggravated by the presence of chemical matter either dissolved in the water or brought to the surface by the latter and left there in the form of a deposit or incrustation. (See EFFLORESCENCE.) The presence of moisture also induces fungoid growths which make their presence known in well-known forms. (See FUNGOID GROWTHS.) Investigation of problems connected with damp walls must be initiated by an investigation as to the cause or origin of the dampness. The most fruitful sources of damp in walls are—

1. The absence of a damp course or a defective damp course.

2. Rain driving through the structure, and in this connexion it may be noted that not only bricks and other well-known porous building materials are capable of allowing water to percolate through their entire thickness but certain kinds of stone are so porous that continued driving rains under a high wind pressure will go right through them.

3. The presence in the wall of mortar, cement or concrete which has not dried out properly and which continues to give off moisture for protracted periods. Dampness may appear either on the outside or inside of a wall according as mechanical pressure is greater on the one side or the other. In the case of a brick wall faced on the inside with plaster the tendency (apart from the mechanical driving force of wind and rain outside) will be for the moisture to travel inwards owing to the greater capillary pull on the inner surface, where the interstices between the particles of solid matter are smallest. A wall of this nature may be likened to a huge system of capillary tubes with their smaller or capillary ends pointing inwards. It is bad policy to treat a damp wall either on the outside or inside before the excess of moisture incidental to wet plaster, etc., has escaped as much as possible by natural means. Long-continued aeration and ventilation are the best means by which to reduce the quantity of moisture in the wall in the first instance, and as soon as a tract of dry weather has reduced the moisture to a minimum steps may be taken to prevent further entrance of moisture on the outside. Means should be taken at the same time to seal up the inner surface in order to prevent any moisture that may be left in the wall and which cannot escape towards the outside from being drawn out through the inner surface. There are various proprietary and specialised materials recommended for the treatment of damp walls both on th outside and the inside, and their nature and properties should be studied from a practical point of view before any specific case is dealt with. A variety of paint is now made which is capable of forming a tough impenetrable film even in presence of moisture, and such a material is very useful for treating the inside of a wall in order to provide a foundation for painting.

papering, etc., a simultaneous treatment with a suitable material being given on the outside also. The efficiency of an external treatment will depend largely on whether the surface is fairly uniform (as in the case of ordinary Portland or other porous stone) or is broken up by a number of cracks or openings as is frequently the case in certain classes of brickwork and is also found on walls which have been rough-cast. The practical difficulty which presents itself in such cases is to obtain a material which will effectively fill these cracks without destroying the natural surface of the building. Expert advice should be taken when important work is in contemplation.

DAMP WALLS, EFFLORESCENCE FROM.
(see EFFLORESCENCE.)

DAMP WALLS THROWING OFF PAPER, LEAD FOIL, ETC.

Materials such as paper, relief-decorations, etc. which are usually affixed to walls by means of an adhesive medium are liable to be thrown off the surface owing to the loosening or destruction of the adhesive. The old method of treating a damp wall was to cover the damp patch with lead foil, but the latter is liable to be thrown off unless attached in a very effective manner. Various kinds of adhesive varnishes and preparations containing hardened glue, etc., are used for the purpose, but none can be absolutely relied upon. It is also found that moisture frequently rises by capillary action above the surface coated with the lead foil, and the higher the lead foil is applied the higher will the damp rise. There are, therefore, considerable limitations to the use of all such expedients, and the mode of treatment will necessarily depend upon the precise conditions surrounding each job.

Darkening of Distemper
(see Zinc Paints Blackening).

Darkening of Lithopone
(see Lithopone).

Darkening of Lead Paints
(see Blackening of White Lead).

Dead, Paint or Enamel Going.

"Going dead" is a painter's term descriptive of a painted or enamelled surface failing to retain its full lustre. The defect may be due to local causes, such as a very low temperature or the presence of excessive humidity in the atmosphere, or it may be due to some chemical change having taken place in the materials, as for example partial decomposition of the varnish constituents in the paint or enamel. Excess of driers also gives rise to this defect. (See Saddening Down, Sinking In and Sleepy.)

Decay of Paint.

Decay of paint is a general term applied to the destruction of paint by time. It is usually, however, confined to that mode of destruction which consists in the paint scaling or flaking off a wood surface owing to the perishing of the oil medium. (See Flaking.)

Description of Goods.

False or inaccurate description of goods is frequently the source of misunderstanding and irritation in the paint and painting trades. There is much need for a thorough revision of many trade terms. Such

terms as "best," "pure," "genuine" and the like, are not now regarded as necessarily indicating that the goods so described are the best for a particular purpose. The reason for this is that chemical composition and commercial purity do not necessarily imply the presence of those physical properties which render paint and pigments satisfactory for particular uses. There are many obsolete terms in the nomenclature of colours and pigments which might well be done away with.

DISCOLOURING OF ENAMEL.

Enamel is frequently employed in decoration with the specific object of ensuring a uniform colour effect throughout a room or building. Any tendency to change colour is therefore to be deprecated. Discolouration of white enamel work is usually due to one or other of three causes :—

1. The presence of lead in some active form (usually as lead compounds in the medium or drier in the enamel) in the enamel. These lead compounds gradually become affected by sulphur compounds in the air with the inevitable production of lead sulphide which turns the enamel yellow. The older enamels which contained a considerable proportion of lead pigment were great sinners in this respect, and it was quite a common thing to find in a room illuminated by gas that an enamel which had originally been white, had gradually assumed quite a yellow or brownish tone.

2. Enamel work exposed to heat and protected from the bleaching action of light is also prone to turn yellow. Thus in a badly lit room the enamel work round a fireplace will frequently assume a yellow colour, which, however, is bleached white under the continued action of sunlight.

3. On new work yellow stains or patches are frequently found on the surface. This can often be traced to the exudation from the wood of a coloured sap. Some of the softer woods now used for panelling, doors, etc., are very liable to produce such yellow stains, and the best method to avoid them is to treat the woodwork with good shellac knotting before any paint is applied. Yellow stains also come through from knots in the wood, owing to the action in the rosin. In the best work the most effective method of keeping back rosin in knots is to cover them with gold leaf. (See Knots in Wood.)

Distemper, Defects in.

These are dealt with in numerous paragraphs under the headings Flaking, Powdering, Gummy Exudations, Lithopone, etc.

Drying.

A paint, varnish or enamel may dry too quickly, or it may dry too slowly. If it dries too quickly and the abnormal speed of drying is not due to local conditions such as a high temperature or rapid evaporation of the spirituous ingredients, there will be a tendency for a brittle and non-permanent film to be produced. Slow drying of paint is one of the common difficulties which painters have to face. It is not correct to assume that the proper cure for this is to add an excess of driers, because the addition of too much drying material will undoubtedly reduce the life of the paint, and may also cause such faults as cracking, wrinkling, and loss of gloss. It has also been found that a great excess of driers actually retards drying. The drying of a film of paint, varnish

or enamel is influenced to an enormous extent by the nature of the surface to which it is applied. The presence of the slightest trace of grease on a surface will prevent the drying of paint to a surprising extent. This has been exemplified in a very practical way in kitchens where the window frames and those portions of the woodwork which have become impregnated with grease from the hands of the domestics frequently take much longer to dry than surrounding parts. Before complaining that a particular batch of paint or enamel will not dry, the painter should always test the drying of the material taken straight from the original package and placed on a clean strip of glass which should be stood on end for 8 to 12 hours, or over night, in a well ventilated place of average temperature. Perhaps more complaints arise as to the bad drying of paint materials than in any other direction, and it is safe to say that nine-tenths of these cases of non-drying are due to causes entirely outside the material. The drying of zinc paints presents problems peculiar to the material, and it is very difficult for a painter using his ordinary thinners consisting of raw linseed oil, turpentine and patent driers to make up a paint that dries really well. The mixed paints containing zinc pigments now manufactured by all the leading paint manufacturing houses show an immense superiority in drying properties over those mixed by the painter himself, but if the latter prefers to mix his own ingredients he should take advice from a practical expert on the subject, and employ a range of thinning materials suited to the pigment with which he is working. The drying of paint is also greatly affected by the temperature and humidity of the atmosphere. Paint will dry in a well ventilated room, but it will remain wet or tacky in an atmosphere which contains stagnant or foul air. While

it is undoubtedly true that from time to time painters are called upon to use materials whose drying properties have not been adjusted to suit the conditions of the work, the fact remains that in the great majority of cases complaints as to bad drying are either not justified or are directly traceable to conditions which the paint manufacturer cannot control. Unequal drying is sometimes found to occur on a large surface, and this almost conclusively proves either that the surface below was abnormal—as for example that it was wet or greasy—or that the air currents at that particular place were of such a nature as to retard the drying process. Not only will stagnant air prevent drying, but a steady stream of cold or moist air will have the same effect. It must not be lost sight of that the nature of the undercoat will also affect the rate of drying, for example, an enamel will dry more quickly on a sharp white lead surface than it will upon a more oily zinc white surface.

Durability.

The length of time during which a protective coating retains its capacity to exclude moisture from the outside and to protect the surface on which it is applied is a measure of durability. The term is applied in this sense in current paint technology, and is the essential factor which governs the ultimate efficiency of protective paints. The term "permanence" (see Permanence) on the other hand, is employed to indicate the degree of endurance of the individual parts of the paint, for example, the maintenance of colour. Thus a pigment may be permanent and yet be unsuitable for yielding a durable paint.

DUST.

The presence of dust at once makes itself manifest on a wet painted or varnished surface. Practical painters, and in particular coach painters, take the most scrupulous care to reduce the danger of dust settling on a wet surface. In the case of outside work such precautions cannot of course be taken, and it is therefore necessary to use materials for such surfaces as front doors in towns which will set on the surface as quickly as possible. There is a great difference between a varnish "setting" and a varnish "drying," and varnish manufacturers are able to supply materials which set quickly on the surface. Thus the risk of dust and other adventitious materials adhering to the surface is minimised, and the varnish can then dry through at leisure, so to speak.

DUTCH METAL.

Is an alloy which consists of about 11 parts of copper and 2 parts of zinc, the precise proportions being varied according to the colour it is desired to obtain. The colour may vary from that of very pale gold to a deep copper red. Dutch metal is made into leaves just like gold leaf, or it may be reduced to the form of powder. (See BRONZE TARNISHING.)

E

Efflorescence.

This is the term applied to describe the appearance on the surface of a wall of salts of lime, due to the action of alkali in the plaster, cement, brickwork, etc. The appearance may consist of a white incrustation on the surface or in extreme cases may result in the production of crystalline filaments consisting of hydrated salts of lime. (See also Alkali in Walls.)

Eggshell Gloss.

A degree of gloss midway between the glossy lustrous surface associated with ordinary varnish and enamel and a dead flat. The effect may be produced purposely by suitable adjustment of the relative proportions of oil and turpentine in the paint or enamel, but it sometimes develops where it is not wanted. Thus many so-called flat varnishes and enamels may develop an eggshell gloss through age or when polished with a duster. This of course is a defect, but it is well known that it is extremely difficult to produce any flat material which does not sooner or later develop a certain degree of gloss.

Elasticity.

The elasticity of a paint, enamel, or varnish is that property whereby it can be stretched under

the influence of variations of temperature without cracking. One of the first signs of the commencement of deterioration in a paint or varnish is loss of elasticity which results in the production of minute cracks or fissures on the surface. (See CRACKING, FISSURING AND CHECKING.)

ENCAUSTIC.

A familiar term in mural painting descriptive of a process whereby pigments are bound on a surface by a wax medium. Similarly encaustic varnish is a material containing wax which produces a dull eggshell gloss surface. The term must not be confounded with "caustic" as applied to alkali.

EOSIN.

A chemical term applied to a certain dyestuff largely used in the manufacture of the old-fashioned vermilionettes (which are very fugitive to light), and in the manufacture of red ink. Eosin is also used to "top up" certain lake pigments and reduced red lead. Its presence is easily detected by simple chemical tests familiar to chemists.

EXCESS OF DRIER.

Excess of drier leads to various defects in the finished work, *e.g.*, cracking, drying on the surface (accompanied by wrinkling), loss of gloss, early deterioration of the surface, and in some cases slow drying. (See DRYING.)

Excess of oil in paint makes the film too soft and elastic and tends to cause blistering. Furthermore, unless the oil be properly reinforced with hard resin

the film readily becomes permeable by moisture.

Excess of turps renders the surface too flat and reduces the binding properties in the film with the result that the paint is liable to chalk or powder. Too much turps also prevents the paint being easily applied, making it work too sharp and setting at the edges of each "stretch."

Excess of Varnish in Flatting.

Painters are sometimes in the habit of introducing a proportion of varnish into their flatting for the purpose of binding it. If this is done the varnish should be of a suitable nature and should not be too oily or elastic, otherwise there will be a tendency for separation to take place, and the varnish may exude from the surface in the form of oily tears. A small quantity of gold size or of hard drying mixing varnish is better than an elastic varnish for mixing with and binding flatting.

Expansion of Metal Work.

All metallic surfaces expand under the influence of rise of temperature, and unless the protective coatings upon them expand equally (see Elasticity) a rupture will take place in the paint film, moisture will be admitted, and corrosion will be set up at the point where the cracking takes place. It is one of the chief arts of the paint maker to adjust the composition and physical properties of the various coats of a protective paint in order that they may expand or contract in conformity with the expansion or contraction of the metal on which they are laid.

EXUDATIONS.

Painted surfaces, whether finished with oil paints, flatting or water paint, are liable under certain conditions to exude tear drops of gummy matter. This is due to partial decomposition (sometimes saponification) of the oily or resinous ingredients of the paint. The trouble is accentuated when walls containing alkali are in question. The phenomenon is also found on walls which are very impervious, as the lack of porosity compels every product of decomposition to come to the surface instead of being absorbed into the wall. Bad ventilation also accentuates the trouble. If the oily drops are removed with hot water as soon as they appear and before they have had an opportunity of running down the wall it is frequently possible to prevent the work becoming unsightly. As a rule the exudation takes place locally on the surface and through minute pin holes in the film. The defect is rarely met with where free access of pure air during drying is permitted.

F

Fading of Colour.

The term, "Fading of Colour," is properly applied to the gradual lightening in tint caused by the action of light, and should not be applied to change in colour due to the chemical action of alkali, etc., in the wall. Very few, if any, pigments are absolutely proof against the long continued action of strong sunlight, but there are certain pigments which are practically imperishable in this respect at ordinary temperatures, *e.g.*, lamp black and similar carbonaceous pigments, native yellow ochre, red oxide of iron, etc. Reference should be made to one of the standard scientific books on pigments in which lists are given of the relative permanence of pigments towards the action of sunlight.

Fat Materials.

Paint or varnish is said to go fat when owing to the action of the driers in the material or to the drying action of the air a complex drying process takes place in the material before it is applied. The result of this is that it becomes thick or even gelatinous in consistency, and fails to dry when applied to the work. Paint or varnish that has gone fatty should not be used. A practical example of fatty oil is presented by the old fashioned oil gold-size, which is prepared by

exposing linseed oil in shallow dishes to the action of the air. After a certain lapse of time the oil assumes a thick sticky consistency and becomes a very bad drier. It is then mixed with ochre or chrome and forms the oil gold-size which some gilders use to prepare a surface to receive gold leaf. It has the advantage of retaining a tack much longer than ordinary varnish gold-size.

FEEDING UP.

This is a popular term applied to paint which has become thick and "puddingy." It may occur either in stiff paints or in mixed paints, and is associated with particular pigments and vehicles. For example, certain resins, notably rosin, dammar, and certain grades of kauri are particularly liable to cause feeding up when brought into contact with basic pigments such as oxide of zinc. One of the chief arts in making an enamel is to select pigments and vehicles which do not induce feeding up even after a prolonged period. Prussian blue and linseed oil also thicken on keeping, and a tin of Brunswick blue and boiled linseed oil has been known to assume the consistency of glue. (See LIVERING).

FESTOONING OF VARNISH.

The term is self explanatory and is practically synonymous with curtaining. The phenomenon indicates that either too much varnish has been applied or that the latter is unsuitable and tends to run down in place of remaining on the work.

FIBRE IN BRUSHES.

(See BRUSHES.)

Filling.

The process of filling a surface preparatory to painting or varnishing is often a most important one. In finishing natural woods with varnish or polish the pores and soft fibre of the wood must first be "filled up" with a hard-drying transparent composition known as "wood-filler." Iron work such as engines and fine castings has to be brought to a level surface by means of an "iron-filler." Filling and stopping are departments of preparation which must not be neglected. A soft filler will cause "sinking in" and deadening of the succeeding coats.

Fineness, Lack of.

The fineness of a pigment means the degree of sub-division to which the individual particles have been brought, and fineness of grinding is recognised as being one of the chief factors in the making of first-rate ground colours and paints. Lack of fineness promotes settling of the paint in the tins, and it also gives rise to a rough or gritty feeling in the finished work. In a few rare instances a certain degree of roughness is advisable, and then absolute fineness of grinding is not imperative. Thus in America where painting is carried out practically every year in the living rooms of houses, the last coat of paint contains a proportion of pigment which is introduced for the purpose of giving tooth or key to the next coat of paint when it comes to be applied. Similarly paints for smooth impervious surfaces such as galvanised iron are all the better for containing a trace of rougher pigment introduced in order to communicate "tooth" or bite to the paint.

FIRES TO DRY PLASTER.

The expedient of lighting fires in a room which has been recently plastered in order to render the walls capable of receiving paint quickly is often a dangerous one. It is of little use to produce artificial heat in a room unless efficient ventilation is maintained. If this is not done the moisture absorbed by the hot air is readily condensed upon the surface of the walls when the temperature falls with the result that no effective result is obtained. Furthermore, the rapid drying of plaster or cement is liable to generate fissures or hair cracks in the wall. Again, artificial heating causes an excessive quantity of moisture to be drawn towards the inner surface. Natural drying allows the moisture to escape towards the exterior, whence it readily passes off into the atmosphere. If the weather is dry, good ventilation is much better than artificial heat, but if in exceptional cases the latter has to be employed it should be done in a scientific manner.

FISSURING

Is that particular form of cracking which results in the formation of fissures running more or less parallel over the surface. When the defect occurs there is often a strong presumption that the surface itself (*e.g.*, the grain of the wood) has played an active part. Checking on the other hand suggests as a rule that the paint film is the source of the cracking. Every case of cracking, fissuring or checking should be carefully investigated, and an examination should be made with a strong lens in order to determine whether the stains that have caused the rupture of the film have arisen in the upper or under layers. Once that point is established it becomes easier to suggest the true cause of the defect.

Flaking of Distemper.

This is due to absence of permanent adhesion between the distemper and the surface. It is very common on impervious surfaces such as smooth-faced plaster and woodwork where key is defective. In the case of water paints flaking is usually associated with materials which contain size or glue. Casein paints are also liable to flake unless the casein is introduced in the form of a proper emulsion.

Flaking of Paint.

Paint flakes or scales from the surface to which it has been applied owing to the destruction of the binding material, and this will be hastened if the surface below is not suitable to receive the paint, as, for example, when it is too hard or glossy. It is characteristic of paint which is flaking that it is very brittle. Very frequently flaking is preceded by checking or cracking. When flaking takes place the old perished paint should be thoroughly removed. This can sometimes be accomplished by means of chisel knives, but in other cases a light treatment with the blow lamp is necessary. Flaking is, of course, a sign that re-painting is necessary, and investigation will usually determine whether the flaking has been due to unsuitable treatment of the work or to shoddy workmanship. The composition of some paints tends to induce flaking, and in general an oily paint will flake more readily than a flat one, always provided that the ground on which the latter is applied is suitable.

Flashing of Paint.

This is the technical painters' term which is

applied to the development of gloss on portions of a surface covered with a flat paint. It is a particularly annoying defect, and may be due either :—

1. to unsuitable adjustment of the liquid ingredients in the paint ;
2. to an unsuitably prepared surface ;
3. to defective workmanship.

If the materials have not been thoroughly incorporated and contain raw or boiled linseed oil in excess or in a badly mixed condition flashing is very liable to occur. If the surface is too hard and non-absorbent flashing is induced, and finally an unskilful or too laborious brush hand will encourage the production of flashing by "playing" with the paint too long. Flat drying materials should be applied boldly and confidently and without over-elaboration in the brush work. As a general rule the stippler should follow the brush.

FLAT PAINT OR ENAMEL TURNING GLOSSY.

There is a great tendency for all flat materials to develop a certain degree of gloss in course of time, or when the surface is rubbed. This is particularly liable to be the case when the binding material in the paint or enamel consists largely of linseed oil. The ideal binder for a flat or semi-flat material is a spirituous varnish, the constituents of which are so adjusted that after drying the film retains the same degree of gloss for an indefinite period. Gloss is particularly liable to develop in the case of zinc paints, which contain a considerably larger proportion of oil than white lead paints, and the pigment in which does not destroy the oil vehicle as white lead does. The reason why white lead flatting does not tend to turn glossy so readily as zinc flatting, is probably the chemical action

which white lead exerts on oil, changing it more or less into a soap. (See also Eggshell Gloss).

Flat Varnish Turning Glossy.

"Flat varnish" is in reality a contradiction of terms, since the term "varnish" strictly implies a transparent liquid drying with a lustrous surface. The materials introduced into oil varnish in order to make it flat or semi-flat always destroy the durability of the varnish, and consequently flat varnish should not be used out-of-doors. The old-fashioned flat varnishes contained a proportion of wax, hence the surface presented by this material never really dried but always retained a certain moist greasy appearance. The more modern flat varnishes are quite hard to the touch, but they tend to develop gloss after a lapse of time, and are rather liable to crack. The most effective method of applying flat varnishes is to first varnish the surface with a good hard drying oil varnish, then to cut the latter down with pumice and water, and on the surface so produced to apply the flat varnish in a thin coat. Repeated coats of a flat varnish will usually be found to produce a glossy result, and the same effect is, as a rule, found with flat enamels and flat paints.

Fogging of Varnish or Enamel.
(See Blooming.)

Freezing.
(See Frost).

Frost.

This is a popular term applied in a somewhat

loose way to indicate a variety of phenomena, thus *efflorescence* is sometimes described as "frost." Again, an enamel or varnish which has been chilled during drying and which consequently developes a rough non-lustrous appearance, is described as frosted. Frost, meaning a temperature below the freezing point of water, has a serious action on many materials, including oils, varnishes and water paints. It has been found that when certain water paints are exposed to the action of a low temperature, the water separates from the emulsion in the form of particles of ice, and the material is rendered practically useless and does not work well even when raised in temperature.

FUNGOID GROWTHS.

Fungoid growths in or on painted surfaces are of more frequent occurrence than many people imagine. Some paints appear to provide an excellent cultivating medium for such growths. A damp and warm atmosphere favours their production. Thus on damp walls several species of black, yellow and green fungi are found. In breweries, dairies and other places where fermentation processes go on fungi are particularly abundant, and the use of specialised paint material is imperative. A very hard impervious surface is the best protection against the lodgment and development of these low vegetable growths, and such a surface must be capable of being washed repeatedly with disinfectants. Painting work under such circumstances falls within the heading of "technical or industrial painting," which is governed by practical rules which differ in many particulars from those adopted in house-painting.

The origin of the fungi commonly associated with paints may be in the surface below the paint, or the spores may be carried on to the paint and may germinate there. Stains or discolourations of an unusual nature which may develop on the surface of a paint should always be examined under the microscope in order to determine whether they are of fungoid origin. Thus the pink stain associated with the presence of *phorma pigmentivora* has precisely the appearance of a discolouration in the paint itself, but microscopic examination soon discloses the fact that the discolouration is due to the presence of numerous bunches of mycelium, a particular stage in the development of which is characterised by the production of pink or purple coloured spores. This is the cause of the pink or purple stains so frequently found in hot houses and greenhouses.

The following are among the fungi and moulds which are most frequently met with on painted surfaces :—

White Mould. The first stages of many moulds produce a white encrusted or fluffy appearance. The branched filaments which compose the colonies of mould are often described as the mycelium, but there is a class of mould, including some of the white moulds to which the specific name "mycelium" is applied.

Black Mould. (*Aspergillus Niger.*) This grows in damp places in presence of organic matter, *e.g.*, on paints containing casein or animal size. It has a disagreeable odour, which is readily communicated to food stuffs, beer, etc.

Yellow Mould. (*Aspergillus Flavus,* and others).

Green Mould. (*Penicilium crustaceum and Penicilium glaucum.*) The former is the familiar pale green cheese mould. It multiplies rapidly and produces the peculiar odour associated with damp cellars.

PINK OR VIOLET FUNGUS. (*Phorma pigmentivora Mass.*) This is frequently met with in greenhouses and hot houses. At a particular stage in its development, it produces pink or violet-coloured spores. It appears to thrive in presence of white lead, and although botanically its life history is pretty well known, the precise conditions which conduce to its development on a paint film are so far rather obscure, as also are the means whereby it can be prevented from spreading on new paint work.

G

Galvanised Iron, Paint Peeling from.

Paint frequently peels from galvanised iron, not on account of the paint having perished (see Flaking), but on account of the mechanical difficulty of getting any paint to adhere firmly to the impervious and glossy surface presented by new galvanised iron. It is one of the chief difficulties in painting galvanised iron to secure a proper foothold for the paint, and various expedients are adopted to overcome this. The most usual of these is to delay painting the galvanised iron till about six months after exposure. In this way the zinc coating on the iron paint becomes slightly oxidised, an almost imperceptible film of oxide forming on the surface of the metal. This provides a better key for the paint than new galvanised iron. This method is objectionable because the zinc coating is liable to become pin-holed, with the result that corrosion is set up in the iron beneath the zinc where the latter is perforated. Another method is to wash the zinc surface with a solution containing chloride of copper. In this way a thin film of metallic copper is deposited on the zinc, forming a key for the paint. The objection of this method is that traces of acid are left on the surface and corrosion is liable to be set up. Perhaps the most effective method of treating galvanised iron before painting (provided the zinc coating is intact) is to wash the surface with hot water containing a

very small proportion of carbonate of soda or borax. The surface is thereby slightly roughened and grease is removed. It has been found that paints applied to a surface prepared in this way not only dry better, but are less liable to peel or flake than when the paint is applied directly on the new galvanised iron. Special paints containing a certain amount of "tooth" are now manufactured for use on galvanised iron.

GELATINISING.

This defect is referred to under "Feeding up," "Livering," and "Curdling."

GENUINE.

The term "Genuine" is an old trade term used in connection with such well-known materials as white lead, linseed oil, turpentine and the like. In former days it meant much more than it does now owing to the growth of technical knowledge regarding the physical nature of paint materials as distinguished from their chemical composition. It is quite possible to make a so-called "genuine" paint which would be extremely inefficient for a particular purpose. Users of paint are therefore advised to make themselves conversant with current technical literature and with the most recent advances in paint technology, always bearing in mind that it is now generally accepted that paints have to be designed to suit the conditions of various classes of work. Thus the best paint for interior house painting on woodwork may be quite inefficient for the protection of external iron or steel against corrosion, and a paint which gives good results in Britain may be practically useless when employed under different climatic conditions in another part of

the world. It is also recognised that a mixture of pigments in a proper blend of liquid ingredients gives better results as regards durability and general efficiency than so-called "genuine" materials mixed singly.

Gilding Discolouring.

"Gold leaf" of the cheaper kinds which contain copper is liable to become discoloured, for the reasons stated in the paragraphs under "Bronze Powders" and "Dutch Metal." But even pure gold leaf is liable to become discoloured under certain conditions. There are great differences in the thickness of different makes of gold leaf, some samples being a half or a third as thick as the leaves of the best makes of English gold leaf. There is an art in applying gold leaf in such a manner as to preserve its brightness, and although the reason is rather obscure it is undoubtedly the case that some workmen are able to obtain much more lustrous and permanent effects than others. This is only one more example of the rule that "workmanship" is often as important as "materials."

Gilding Peeling off Glass.

Practical gilders have a special method of fixing gold leaf to glass, isinglass being frequently employed as the adhesive. If the adhesive be of a bad quality or is badly applied it may shrivel and flake off the surface taking with it the gold leaf.

Glaze.

In painters' phraseology a "glaze" is a coating mostly composed of liquid of a varnish nature but containing sufficient pigment to colour it and produce

a definite decorative effect. For example, in order to suggest the effect of certain kinds of wood a surface may be treated with a sufficient number of coats of paint in which pigment predominates in order to produce a uniform and opaque ground of a selected colour, which may be buff, or grey, or green, or crimson. On this surface a varnish containing a small quantity of somewhat transparent pigment may be applied in such a way as to produce an irregular colour effect, so that the ground is seen through the superimposed varnish layer in an irregular way. Brush graining and other modern decorative devices are founded on this method. The combination of liquid vehicle and transparent pigment is called a glaze. (See "SCUMBLES.")

GLOSS, LOSS OF.

All paints, enamels and varnishes tend to lose their gloss in course of time, but provided that the material is of good quality and there is no cause for loss of gloss inherent in the paint or varnish itself the gloss will be retained very much longer if the surface is kept clean. Deposition of soot, smoke, moisture, atmospheric condensation and the like all tend to reduce the gloss owing to the severe chemical action which these agents have on a painted or varnished surface. A well finished coach panel which in the ordinary course is washed every day will retain its lustre for years, but if the same panel were allowed to go for months at a time without other washing than that which it would obtain by rain, the gloss would very quickly disappear. The application of clean water followed by polishing with a chamois leather is the best way to assist the retention of gloss. Loss of gloss, however, may occur from causes quite outside

those indicated above, as, for example, when owing to the action of too much drier in the material the oil is destroyed causing the pigment to predominate and thereby producing a flat surface. Or again, insufficiently ground or badly mixed paint or enamel tends to lose gloss on account of the particles of pigment gradually absorbing the liquid vehicle. This is very noticeable in the case of paints and enamels containing oxide of iron. Certain varieties of oxide of iron pigments are very difficult to grind, and a paint or enamel may be produced in which each particle of pigment is not surrounded by an envelope of oil. Sooner or later the particles will surround themselves with this envelope at the expense of the surrounding vehicle, and the visible result which follows is loss of gloss.

In the case of enamels loss of gloss is very liable to occur if the last undercoat is made too flat. This implies that the pigment composing the surface is not satisfied with oil and is therefore absorbent. Certain enamels when applied on such surfaces readily part with a portion of their liquid constituents with the result that the balance between pigment and vehicle is upset, and loss of gloss results.

Gold Leaf, Protection of.

In order to retain the full beauty of gold leaf it should not be covered with anything at all, but on exposed work it is frequently coated with very pale varnish or colourless lacquer in order to protect it. If oil varnish is employed it reduces the brilliance of the gilding.

Gold Leaf, Use of for Knots.

One of the most efficient methods of preventing

the rosin in knots in wood showing through paint is to cover the knot with gold leaf, and in the best class of work this method is frequently adopted. Only the best materials should be used however. Some people prefer to bore out the knot and fill the hole with stopping before applying the gold leaf.

GOLD SIZE.

A clear distinction should be made between the two classes of gold size :—

1. Gilders' gold size, the function of which is to provide an adhesive on which gold leaf is applied.

2. Japan gold size, the object of which is to provide a binding material for pigments.

The essential function of the latter class being to bind particles of pigment together, materials purchased under this name should be examined in order to see whether they effect that purpose. It is not only necessary to test the material by itself on glass, but the gold size should also be mixed with the pigment with which it will be used in order that its binding properties may be judged. Owing to new methods of varnish manufacture gold size is now offered which contains practically no hard resin, but is simply a mixture of thickened linseed oil, turpentine or turpentine substitute and drier. Such a material should not be described as gold size at all. Gilders' gold size is made in a variety of modifications in order that the length of time during which it will "hold a tack" before the gold leaf is applied may be modified to suit the requirements of the case or the idiosyncrasy of the gilder. There are three chief modifications of gilders' gold size—quick, medium and slow, and these again are capable of indefinite modification on either side, and several of the best varnish houses who specialise in this material

make as many as six different grades of gilders' gold size.

Grain, Raising of.

When water stains are applied to woodwork there is danger of the grain of the wood being raised owing to the unequal absorption of moisture by different parts of the fibre. This is one of the great objections to the use of water stains, and it is also an objection to the use of alkaline paint removers in cutting down or removing paint on woodwork.

Grease.

It should be an invariable rule in painting to ensure that every particle of grease is removed from a surface before paint is applied. Not only does the presence of traces of grease reduce or even prevent the adhesion of paint to the surface, but it materially affects the drying, and cases of slow drying or prolonged "tack" on the paint are very frequently traceable to grease underneath. All surfaces suspected of being greasy should be thoroughly washed down and cleaned before painting. This rule does not apply only to interior surfaces. External railings and other iron work which have become dirty owing to the deposition of soot and dirt from the atmosphere often carry quite a large proportion of greasy matter, which must be removed before the first coat of paint is applied.

Green Changing Colour.

All pigments of the Brunswick green class (which contain chrome yellow and Prussian blue) are liable to

change colour. When no active chemical matter such as alkali is present they gradually become yellower in tone owing to internal chemical action between the Prussian blue and the chrome yellow, the latter of which gradually destroys Prussian blue. A can of Brunswick green paint of a light or middle shade will always be found to become yellower in tone after keeping. Brunswick green and mixtures containing that pigment are peculiarly susceptible to the action of caustic alkali in or on the surface. Distempers and water paints, therefore, which have to be applied on new walls, should be free from pigments of the Brunswick class. It depends on circumstances whether the chrome yellow or the Prussian blue is destroyed first when a water paint or distemper containing a mixture of these pigments is applied to an alkaline surface. Sometimes the chrome is acted on first, in which case the green becomes blue. In other cases the blue is acted on first, in which case the surface turns yellow. Different makes of Prussian blue are attacked somewhat differently by alkalies, and the same thing applies to chrome yellows. As a rule, the lighter the shade of chrome (*i.e.*, the less basic it is) the more readily is it affected by alkali.

GRINNING THROUGH.

When a dark coloured surface is imperfectly obscured by the coatings of paint applied over it, it is said to "grin through." If the surface grins through after a reasonable number of coats have been applied, it points to lack of opacity in the paint. Grinning is particularly liable to occur when the surface is not uniform in colour, and the most practical method of reducing the risk of grinning to a minimum is to touch up such abnormal places in order to bring the surface

to one fairly uniform bearing in colour after the first coat is applied. Should it be necessary to entirely change the colour of a surface, *e.g.*, to convert a dark brown or black surface into white, the practical method is not to start off with a pure white coat but to break down the first coat with a small quantity of colour which will produce a tint of the same nature as but lighter than the surface. Thus black should be treated with a first coat of light slate, the second coat being white just broken on the slate side and the third and last coats being white. Dark brown would be changed to white by using as first coat white broken down on the brown or yellow side and so on up to white. In this way much more uniform results are obtained, and there is much less danger of grinning than if every coat was white. (See Opacity.)

Gritty Paint.

One of the most objectionable defects to which paint is liable. No good paint for which a fair price is paid should present this defect. (See Fineness).

Ground Unsuitable for Paint.

Much skill and experience are necessary on the part of the painter in order to judge the precise degree of hardness desirable in a surface which has to be treated with further coats of paint or which has to be enamelled or varnished. This is one of those points which must be left to the practical craftsman and is a department in which it is absurd for a paint manufacturer to interfere. But it is within the power of a properly qualified manufacturer to prepare under-coats, primings, and finishings suitably adapted to the various grounds which the painter prepares, and the best guarantee

for success is for the manufacturer and the painter to co-operate in such matters. Under the headings "'Cissing,'' ''Loss of Gloss,'' etc., indications are given of the phenomena which occur when paint or other material is applied on an unsuitable surface.

GUMMY EXUDATIONS.

It sometimes happens that the binding material in paint, particularly if the latter be of the nature of varnish, becomes decomposed under abnormal local conditions. The conditions which promote this decomposition are chiefly alkali in the wall and bad ventilation accompanied by moisture on the surface. The result is that at certain points on the surface there exude oily or varnish-like tear drops of a dark coloured material. These act as condensation points for moisture, which runs down the wall leaving a streak or mark behind it. The effect produced is very unsightly and very often cannot be removed by any treatment short of the application of another coat of paint. If the phenomenon is noticed in time the exudation can usually be removed by local treatment with hot water. These tears may be observed not only on enamel surfaces but also on surfaces finished with flatting which contains varnish as a binding medium, and is also quite common where certain brands of water paint are used. Owing to the absorptive nature of the water paint the marks sometimes disappear if free ventilation is maintained, but in acute cases they are permanent and the work has to be re-treated.

H

Hairs Coming out of Brushes.
(See Brushes.)

Hard Drying Paints and Enamels.

In the strict trade sense the term "hard drying" is usually employed in contradistinction to the term "elastic," and implies a varnish or enamel which produces a film which does not readily respond to changes in temperature. Such materials are, therefore, usually employed on interior work, as they are too brittle and non-elastic for use out of doors. It is not uncommon, however, to hear a varnish described as a "hard-drying elastic varnish," a term which if it means anything at all is intended to denote varnish which while elastic on account of the presence of a proper proportion of oil also possesses the property of drying with a hard impervious surface. Anyone who uses hard church oak varnish or other typical hard drying varnish out of doors is simply looking for trouble.

Hardness in Varnish or Paint, Lack of.

Speaking in very general terms one may say that an essential property of paint is capacity to dry, and an essential property of varnish is capacity to dry hard. But a paint, varnish, or enamel film may be "dry" without being "hard," and the two conditions are

entirely different and depend on different factors. A film of boiled linseed oil will never assume the same degree of hardness as a film produced by an oil in which a small proportion of hard resin has been dissolved, although it may possess properties which are lacking in the varnish film. Hence in dealing with the relative hardness of paint films due regard must be had to the constituents of the paint. It is for this reason that the class of paints known as "enamel paints" (a term which implies the presence of a proportion of hard resin or specially treated oil) are particularly applicable in cases where a really hard surface capable of being polished down is desired. The expedient which the practical painter adopts in order to obtain a hard surface which can be polished or rubbed down, is to mix his pigment with a vehicle in which a large proportion of the oil is replaced with volatile spirit. In this way he gets a film composed largely of pigment, and in which the oily matter plays the part of a binder and not as a true vehicle in excess. In many cases hardness is secured at the expense of durability.

HARDNESS OF SURFACE.

When coat after coat of paint is being laid on, it is of the utmost importance to ensure that each coat when dry possesses a suitable degree of hardness in order to provide a suitable key and a secure foundation for the next coat. (See CISSING).

HEAVY PIGMENT.

Practically speaking, the term "heavy" as applied to pigments should be limited to those whose specific gravity is relatively great, for example, red lead, white lead, oxide of zinc and barytes form a range of

pigments whose specific gravity is highest in the case of white lead and lowest in the case of barytes but which may all be classed as heavy pigment in contradistinction to such materials as china clay, silica, whiting, asbestine, etc., whose specific gravities are considerably less. The term "heavy" is sometimes applied loosely to pigments which for some reason or other tend to fall out of suspension or which settle from mixed paints. This tendency to settle has really no relation to the specific gravity of the pigment but is due to the physical properties possessed by the pigment and also to the size of the particles. For example, oxide of zinc (whose specific gravity is usually about 5, and therefore higher than the specific gravity of barytes) is much less liable to fall out of suspension than the latter pigment, for the reasons that the average size of the pigmentary particles of oxide of zinc is smaller and its physical properties are such that the particles tend to remain suspended longer in a liquid vehicle than do those of the more crystalline material barytes.

Undue "settling" in the case of pigments other than such crystalline pigments as barytes, silica, etc., is often a sign of insufficiently ground material. But it must be remembered that some pigments, (*e.g.* emerald green and vermilion) cannot be ground very finely. (See Settling.)

Hiding Power.

(See Opacity.)

Hot Surfaces.

Surfaces which are hot or which are exposed to heat present problems of their own. Paint which contains too much varnish or volatile constituents will set

too rapidly and will be liable to shrivel and powder off. If the paint is too oily the drying may be interfered with, and unless the physical properties of the paint are carefully adjusted the film when dry will tend to peel off from the undercoating or priming. In dealing with hot surfaces it is always advisable to determine the temperature of the surface, and if the latter is much over about 120°F., special adjustments in the composition of the paint are necessary, but suitably prepared oil paints may be used up to about 220°F. Much will depend on the "filling" which has been applied to the metal work, and special materials are made for this class of work. White or light coloured paints will always be found to change colour on a hot surface and become yellow in tone. This is due to the action of the heat in presence of the metallic constituents in the driers on linseed oil. Special engine paints, radiator paints, funnel paints and the like are available, the specific properties of which should be investigated when the painting of hot surfaces is in question. Certain pigments are acted on at temperatures above the normal and these should be tabood.

HUMIDITY.

Humidity or moisture in the form of vapour in the atmosphere is a factor of great importance in the application, durability, and drying of paints. Moisture on the surface prevents paint from adhering firmly to the coats below and may also cause blistering and other defects. A humid atmosphere during drying causes abnormal results in that process, but reliable scientific investigation is wanted to prove precisely what effect temperature and various degrees of humidity exert on the drying of paint films. It is certain

that excessive humidity retards and may entirely prevent drying, but it is impossible to deal with the question of humidity apart from that of temperature inasmuch as atmospheric air possesses a different capacity to retain moisture in the form of invisible vapour at every temperature. Moisture in the oil used in paint-making is believed by some to give rise to a film which is easily attacked by external agencies and which rapidly becomes pervious to moisture and gases. Moisture in pigments is to be avoided as much as possible as a general rule. (See Water in Paint). For example putty cannot be made satisfactorily from whiting which is damp, nor does oxide of zinc produce a reliable protective coating if the pigment contains moisture. On the other hand, certain lake colours only present their full beauty when a proportion of moisture is present, and this is exemplified very noticeably in the case of certain lake pigments used in the making of lithographic inks and some other products of a special nature.

Hygienic Paints.

There is a growing demand among users of paint materials for paints which can be described as "hygienic," *i.e.*, not inimical to health. A paint may be unhygienic for several reasons. For example, white lead is unhygienic on account of its strongly poisonous nature. But a paint or preparation of a paint nature may be in effect unhygienic although none of the ingredients are in themselves active poisons. For example common distemper made from whiting and animal size cannot be classed as a poisonous preparation, and yet a coating of this materials on walls of a living room often contains micro organisms and bacteria and so becomes in

reality an unhygienic material, inasmuch as it affords a suitable medium for the cultivation and propagation of minute forms of animal and vegetable life. The subject of hygienic paints is one which is only now coming to the front, but there will probably be a great revival in public interest in such matters in the near future.

I

Icicling of Varnish.

It sometimes happens that at the bottom of a door or window which has been varnished, the varnish runs down and forms icicles or tears below the under-edge. This may be due either to too generous a coat of varnish having been applied or to the ground having been too hard, and consequently having provided insufficient key for the varnish. Another cause may be that the varnish lacked viscosity. The cause of the defect when it occurs can usually be identified with ease, as it does not take a practical man long to find out whether a particular lot of varnish possesses the proper degree of viscosity for his work.

Ingrain Paper.

Some years ago when the vogue of plain surfaces came in there was a run on the part of the public on a class of wallpaper known as "ingrain," a term which denotes comparatively cheap paper made from wood pulp which has been stained during the process of manufacture with soluble dyes. Ingrain papers present special difficulties for two reasons of entirely different natures :—

(1.) Owing to the exceedingly porous and spongy texture of the paper it is practically hopeless to attempt to paint over it with ordinary oil paints,

although it offers an exceedingly good mechanical ground for water paints and distemper.

(2.) The chemical nature of the soluble dyes used in the colouring of these papers renders it a precarious matter to cover them with coloured paints or distempers. Thus the green dye in a green ingrain paper has been known to eat through three coats of a good water paint and to produce entirely unforseen and extraordinary changes in the pigmentary matter of the water paint. The most practical course, therefore, is to strip all walls which have been papered with these papers and either to line the wall with white lining paper or to distemper on the plaster.

IRON, PAINTING OF.

The results aimed at in the painting of iron and steel are fundamentally different from those usually sought in connection with the painting of wood. The ultimate object in painting metals is to protect them from external influences. It must alway be remembered, however, that corrosion in iron or steel may proceed from the metal itself. An iron or steel surface is not impervious, and under the ordinary conditions which attend the painting of such surfaces there is a great probability that rust has formed on the surface or within the minute pores and cavities which are hardly perceptible to the naked eye. When rust spots come through paint they can usually be traced to points on the surface of the metal beneath where corrosion has been set up through some local action of this sort. The ideal procedure in applying to iron or steel the first or priming coat of paint is to treat it while the metal is still hot, that is, immediately it has left the rolling mills or foundry. This ensures, provided that the work is properly done with suitable

materials, that the paint is drawn into the pores of the metal as the latter cools, forming a hard impervious filling or stopping on which subsequent coats of paint can be applied with reasonable expectation of success. The undercoats should not be made so sharp (*i.e.*, they should not contain so much volatile liquid) as is usual in the case of undercoats on woodwork, and the finishing coat should be specially selected with a view to preventing the ingress of moisture and gases from the outside. Reference should be made in this connexion to current technical works and pamphlets on the subject and to the proceedings of the Paint and Varnish Society.

J

JAPAN BLACK.

Black Japan, or Japan Black as it is sometimes called, is a material which has altered very much in its composition and mode of manufacture during recent years. Originally it was a true black varnish consisting of oil, turpentine, drier and black asphaltum, the latter ingredient taking the place of hard resin in ordinary varnishes. More recently, however, many substitutes have been used for the original asphaltum black. The demand for cheap black varnishes has had the inevitable result of producing cheap substitutes. Black japan may be divided in two great classes—coachmakers' black japan and decorators' black japan. The former material is chiefly used over a ground of drop black in turps on the black portions of coaches and carriages. It must be capable of being rubbed down like varnish, and must also be capable of being varnished over with a carriage or body varnish without developing a green tone of colour. The possession of these properties implies that the materials used in its composition must be of the best. House painters, on the other hand, use black japan chiefly for the purpose of staining or modifying other materials, and for touching up black portions of work which are required to dry quickly. The ingredients used in this class of black japan need not be selected with such care. Nevertheless, unless

the black colouring matter in the japan is of a proper nature various unforseen results may occur, such as coagulation in the paint, blooming, etc.

Japan Gold Size.

(See Gold Size.)

Jelly Size.

This is made by dissolving certain of the soluble products of the bones and offal of animals in water. It is a highly putrefactive material and in process of decomposition gives rise to alkaline products. It is not unlikely that the fading of certain pigments in distemper could be traced to the united alkaline action of partially decomposed size and second-rate whiting. Originally, when animal size contained a larger proportion of gelatine and chondrin than is the case to-day, a definite chemical action occurred between the lime in the walls and the organic compound present in the size, but now-a-days, owing to the increase in the use of portions of the soft tissues and intestines of animals in making size, the cheaper grades of that material must be regarded as extremely unhygienic, and only suitable to act as cheap binding material for the roughest kind of distemper work.

Jellying of Paints and Varnishes.

(See Curdling, Feeding Up, Livering.)

K

KEY, LACK OF.

One of the essential properties that a surface must possess in order to enable it to take a coat of paint or varnish is that described as "key," which implies a number of properties the sum total of whose effects is to produce a surface which is neither too hard nor too soft, too glossy nor too flat, and which will enable the coat superimposed upon it to adhere to it without running, cissing, softening, etc. The adjustment of each coat in order to produce a suitable key for the next coat is one of the niceties of paint manufacture which many paint manufacturers have long neglected, and it is largely for this reason that many painters assert that it is only the man on the job who can properly mix the paint to suit the requirements of each coat. Owing to the practical study which the leading paint manufacturers now give to the subject of paint from the point of view of the requirements of the user this state of things is rapidly being done away with, and paint can be supplied for practically any purpose and tempered to suit the requirements of each coat provided the manufacturer is made acquainted with the conditions to which such paint will be exposed.

Knots in Wood.

The penetrative and destructive action of rosin on paint is frequently exemplified by discolouration, and in extreme cases softening or destruction of the paint over knots. Reference is made to this in other paragraphs, but broadly speaking this effect may be regarded as a sign of imperfect or improper preparation of the surface. There are only two really thoroughly effective modes of doing away with the possibly bad effects of knots. One is to bore or gouge out the knot entirely and then to fill up the hole either with a plug of hard wood and stop carefully all round, or, if the knot is a small one, by filling up the hole with hard stopping. The other method is to lay gold leaf over the knot. A less satisfactory expedient is to burn out the rosin in the knot by means of the top of a flame of a blow lamp. If this method is adopted a useful practical wrinkle is to encircle the knot with a piece of tinplate with a hole cut in it, and to direct the flame inside the open circle. This prevents sco ching of the surrounding wood, and concentrates the heat of the flame where it is most wanted.

Knotting as a Primer.

On certain surfaces of a porous nature a variety of thin knotting is at times a useful material for the purpose of stopping suction. Of course, such a material is of little use on an alkaline wall, but cases arise where a spirituous *claire-colle* of this nature has its merits, and is certainly more hygienic than a coat of size.

Knotting, Patent.

In a great many cases the methods described in the last paragraph for dealing with knots in wood are

too costly, and consequently recourse is had in general practice to a material which interposes a more or less impervious layer between the resinous knot and the paint applied over it. This material is known as "patent knotting" and consists of shellac dissolved in methylated spirit. For the making of good stout knotting not less than 3lbs. of button shellac per gallon of methylated spirit are used, and sometimes even a larger proportion of shellac than this is introduced. In order to introduce a fictitious "body" or viscosity into the knotting other cheaper resins are sometimes used in addition to shellac. Thus sandarac, soft manila, and common rosin are frequent adulterants, but the knotting which contains these cannot be regarded as effective. Even the shellac itself may be the carrier of adulterant by reason of the fact that many samples of button shellac are contaminated with rosin. It is advisable, therefore, to purchase knotting only from a house of repute, and to pay a reasonable price for it. The grade of goods sold at 5s. or 6s. per gallon cannot be of first-rate quality in view of the current market values of methylated spirit and shellac.

L

Lakes.

In technical paint language a lake is a true pigment, *i.e.*, it is a material which possesses colour and opacity, and is insoluble in the medium in which it is used. This definition separates the true pigment lakes from "dye-stuffs" which are soluble bodies. There is an intermediate group the members of which have been termed "pseudo lakes," *i.e.*, they are midway in their solubility between the true pigment lakes and the true dye-stuffs. The defects to which lake pigments are subject are bleaching, bleeding, livering or darkening in colour, and the degree to which the lake in question will exhibit one or other of these defects will depend upon its origin, composition, and the care taken in its manufacture. No material of the nature of lake should be used in good-class work or under conditions which necessitate durability without stringent enquiries having been made as to its suitability for the purpose in view.

Laminated Lead
(See Lead Foil).

Lapping.

Lapping is the effect produced when the edges of each "stretch" of paint or distemper can be detected in the finished work. The effect is due to the edges

having set wholly or partially before each stretch is joined up with the one preceding it. The phenomenon is more usual on very porous surfaces and in warm weather, in both of which cases the medium (water in the case of distemper, turpentine in the case of oil paints), separates too quickly and prevents the work being "kept alive." The difficulty can be prevented by rendering the surface less porous either by applying a *claire-colle* coat (if distemper is in question) or by a suitable undercoat (if the work is in paint). It is a very unsightly defect, and as a rule indicates lack of practical skill or knowledge on the part of the workman, who ought to be able to prepare the surface and temper the materials to suit special conditions.

LEAD FOIL, FIXING OF.

Lead Foil is an approved though somewhat old-fashioned method of treating damp walls. There are two practical difficulties met with in the use of the material.

1. The difficulty of securing permanent adhesion between the wall and the lead foil.

2. The tendency of moisture to creep upwards when lead foil is applied owing to capillary action.

In order to reduce as far as is practicable the possibility of lead foil becoming detached from a damp wall certain precautions are necessary in connection with the nature of the adhesive used and the manner of its application. If the wall or surface to be covered is very damp coat the area on which lead foil is to be affixed with old fat varnish, allow this to stand until tacky or almost dry, and the lead foil can then be laid on and rolled flat. The adhesive nature of the varnish below is as a rule sufficient to hold it, but

as an additional precaution "gimp pins" may be put round the edges of the lead sheets. The pin heads do not show through subsequent papering. In ordinary cases use strong paste without any addition of size or glue, coat the lead sheets very thinly, and roll on to the wall, let the rolling be done firmly and from the centre outwards in order to squeeze out air bubbles and superfluous paste. For purposes such as the above where strong adhesive properties are required rye flour paste is better than wheaten flour paste. Another method is to mix dry white lead oil, varnish and a little turps to a paste which is spread on the lead sheet with a palette knife, the sheet being then rolled evenly on to the surface. It is advisable in all cases, especially if the wall is very smooth and affords little key, to scratch the surface with diagonal lines before applying the foil. In most cases where the lead has failed to hold, too much paste has been applied to the sheets. They should always be thinly coated and rolled heavily, and a full day should elapse before paper is applied on the top. The reason for avoiding size or glue is that moisture tends to dissolve and loosen such adhesives. The roller which is most suitable for the processes described is a hard beechwood roller not a rubber or felt-covered roller.

Lining Paper.

Old walls which have been previously papered or distempered, and which present a variety of conditions as to porosity, cracks, etc., are frequently lined before being treated with distemper or water paint. If this method be adopted white lining paper should invariably be used. It should be a good quality, neither too open and porous nor too stout. If it is too open and porous it absorbs the liquid constituents of the

distemper too quickly, and the surface will work "hot," and good brush work will become an impossibility. If the paper is too heavy, as for example in cartridge papers, the contraction which takes place when the distemper or water paint dries is liable to pull the paper right off the wall. The objections to the use of coloured lining paper are :—

1. These papers are usually sized or surfaced in the process of manufacture, and this surface finish works up under the brush and makes it difficult to obtain good results when the distemper is applied.

2. The highly fugitive colouring matter used in tinted lining papers is liable to affect prejudicially the colouring matter in distemper or water paint applied over them. Practical men are divided in their opinions as to whether the edges of lining paper which is to be painted or distempered should be "lapped" or "butted." If the latter method is adopted, scrupulous care should be taken that the butting is done with great nicety, and if a coloured paint or distemper is to be applied over the lining paper, the wall immediately beneath the butted edge should be tinted with a strip of the finishing colour in order that should contraction of the paper occur in drying, a white line of naked wall may not become visible. Experts in the application of water paints frequently advise that careful lapping is preferable, the lap not exceeding one-eighth of an inch. In this way the contraction of the paper which occurs when the water paint dries causes the lapped edge to stretch, so that the ultimate effect is that of a very close "butted joint."

LINSEED OIL CURDLING
(See CURDLING).

Lithopone Changing Colour.

This is an inherent defect of lithopone and is the chief reason why the pigment has not gained wider popularity as an alternative to white lead. The changing of colour may be of several kinds :—

1. All lithopone pigments possess what paint experts describe as "photogenetic properties," *i.e.*, under the influence of sunlight and especially in presence of moisture a surface coated with lithopone is liable under certain conditions to assume a grey appearance which in extreme cases may approach dark slate or lead colour. The appearance is particularly noticeable when the lithopone is a constituent of water paint, although the phenomenon occurs also in the case of oil paints containing lithopone. No entirely satisfactory explanation of the phenomenon has been advanced, and users of paints containing lithopone should clearly understand that under certain conditions the defect *may* make itself manifest. At the same time it is fair to say that of recent years manufacturers of this useful pigment have been able to eliminate the tendency to darken in the great majority of cases, and up-to-date paint manufacturers in making paints which contain lithopone are also able by introducing certain reinforcing pigments to reduce the tendency to discolour to a minimum.

2. Paints containing lithopone tend to become yellow particularly in the absence of direct sunlight as for example in the dark parts of a room or behind pictures, etc. The cause of this is entirely different from the causes which operate in the darkening of lithopone, and depends on the tendency of linseed oil to darken in colour under the influence of certain conditions. A curious feature of this phenomenon is that paint which has become yellow in the manner

described frequently assumes its normal white appearance when exposed to direct sunlight.

LIVERING.

The term "livering" is applied to the change of a paint from a more or less viscous fluid to a condition which may vary from a slightly jelly-like mass to a material possessing a tough liver-like consistency. The precise chemical reason for livering is often obscure and is in any case highly complex, but generally it may be said that the phenomenon is due to some chemical action having taken place between soluble compounds in the pigment and certain of the constituents of linseed oil. Thus the minute trace of sulphur sometimes found in lithopone pigments is sufficient to induce livering, which indeed is not unlike incipient vulcanising. Similarly minute traces of lead, calcium or manganese compounds may set up livering when such pigments as certain of the lakes, Prussian blue, etc., are in question. It is a disagreeable and irritating defect which is undoubtedly inherent in the paint itself, and paint that has gone "livery" should always be used warily, or rejected altogether.

LOSS OF GLOSS

(See GLOSS, LOSS OF).

M

Mildew
(See Mould).

Mineral Oil.

In cheap paints mineral oil finds a certain use, but it can only be regarded as a sophistication or adulterant. It may consist of mineral oil of the petroleum class or of rosin oil. The general chemical name given to such materials is hydro-carbon oil, *i.e.*, oil consisting only of carbon and hydrogen. In the case of cheap paints such as those exported to certain countries where owing to the hot climate painting is carried out almost as often as distempering is in this country, proportions up to 10 or even 15% of hydro-carbon oil calculated on the total oil present, may not be objectionable, and indeed many paints are on the market which contain more than this proportion of non-saponifiable oil. Mineral oil, however, should be strictly tabooed from protective paints. The usual defects in paints containing even small proportions of mineral oil are lack of impermeability and a tendency to "sweat."

Moisture.

One of the great aims of the manufacturer of protective paints is to ensure that the final film of paint or enamel shall be as impervious as possible to moisture. This result is obtained partly by careful adjustment of the materials composing the finishing paint or enamel, and partly by subjecting the pig-

ment to efficient grinding in order that the particles composing it may be as finely divided as possible, and may be closely packed together and firmly cemented in the binding material in the final film. Linseed oil under the influence of the atmosphere inevitably perishes after a certain lapse of time, and consequently all paint films ultimately become more or less porous. They will effect their purpose as efficient excluders of moisture in relation to the care and skill bestowed on their manufacture. It has been found that too great a preponderance on the one hand of pigment or on the other of oily vehicle renders the film permeable by moisture. Hence the best decorative paints are not always the best protective coatings.

MOISTURE IN OXIDE OF ZINC.

Oxide of zinc is a strongly hygroscopic material, *i.e.*, it has a strong affinity for moisture, and practical paint grinders are aware of the necessity for protecting their dry oxide of zinc from the action of atmospheric moisture. Oxide of zinc which has become moist or damp is difficult to grind and even after it has been amalgamated with thinners to form a paint, the material so produced is found to be liable to certain defects such as "blooming." Paints made from damp pigments tend to disintegrate prematurely.

MOISTURE IN PAINT.

Paints which are intended for use on iron-work should contain no moisture, because moisture invariably tends to induce corrosion. In the case of paints for house painting moisture is objectionable

inasmuch as it tends to promote blistering. The moisture is gradually drawn to the surface where it is imprisoned by the hard oxidised outer film of paint. In struggling to escape it forms those well-known bubbles known as "blisters." Similarly, moisture on a surface which is about to be painted, is highly objectionable, and care should be taken before painting over a surface where durability is in question that there is no moisture present. Moisture may not always be visible on a surface, and a coat of flat or semi-flat paint being somewhat porous may absorb moisture in the form of vapour. A film of highly glossy paint laid over such surface will always lack durability and will likewise tend to blister. It is frequently found that newly formed blisters if pricked exude a drop of moisture, which clearly indicates that the blister is due to the blowing up of the surface by the imprisoned vapour beneath.

Moisture in Whiting.

Ordinary whiting (carbonate of lime) is hygroscopic partly on account of the small trace of caustic lime which is often present. The best putty is made from whiting that is free from caustic lime and that is maintained in a perfectly anhydrous condition. Putty that is made from wet whiting is liable to become hard or "short" on keeping, and also tends to crack after it has dried.

Mould.

Moulds are vegetable organisms of a fungoid nature which readily develop under suitable conditions, the chief of which are a moist and fairly high temperature, but certain of them also require special conditions

such as the presence of alkali for their development and growth. There are several specific moulds well known to infest painted surfaces. (See FUNGOID GROWTHS.)

In addition to the vegetable moulds which owe their propagation to the presence of spores in such situations as breweries, green-houses, etc., there are a number of bacteria and bacilli which flourish on a paint coating. These are found in hospitals, operating rooms and the like. It consequently becomes necessary when a material like enamel paint or enamel is used for the treatment of walls of buildings in which such germs may be present that it be of such a nature as will enable it to withstand the action of repeated washing with disinfectants. This implies a highly specialised and perfectly amalgamated material, one of the main objects of which is to maintain a hard and impervious surface which will not afford a foothold for colonies of the germs, and which can be cleansed without damage to the surface by means of such disinfectants as carbolic acid, formalin, and the like.

MUD SPOTTING ON VARNISHED PANELS.

It is a fact well known to practical men that varnished panels retain their brilliant surface longer if they are frequently cleansed from mud and adventitious particles of grease and soot. A spot of greasy mud such as that produced in the streets of a large town contains material of an active chemical nature, and if a spot of such mud is allowed to rest for a prolonged period on the varnished surface of a door or piece of carriage work the fine surface lustre will be permanently damaged. Frequent careful cleaning therefore tends to preserve varnished surfaces.

N

Naphthalene in Lamp Black.

One of the well-known constituents of coal tar is naphthalene known sometimes in commerce as "white carbon." Naphthalene being one of the less volatile constituents remains behind to a certain extent after the more valuable products have been distilled off. Lamp black is largely manufactured by burning the residual oils obtained from the distillation of coal tar, and hence it is liable to contain traces of naphthalene which is sublimed in an unburned state. It is objectionable because it communicates a greasy texture to the lamp black, and it also renders the pigment a worse drier than it would otherwise be.

New Varnish.

"Age brings honour," reads the old saying, and it is especially applicable in the case of no small number of paint materials. There is an indefinable quality and ripeness produced by maturity and careful storing in the case of varnish, white lead, linseed oil, and even high-class enamels which is unattainable by any other means. In the case of oil varnish one of the chief gains derived from keeping is the gradual

elimination of all solid suspended matter. In this way a properly made varnish becomes what is technically termed "star bright." At the same time the oil, hard resin, volatile thinner and drying material appear to become more intimately blended and amalgamated, and the result is that, provided a varnish consists of good material properly amalgamated in the first instance, it gains in working properties, lustre and durability by the influence of time. The effect of age on white lead ground in oil is well known to painters. The practice which obtains in the north of England and in Scotland of purchasing ground white lead of a much slacker consistency than is used in London and the south of England is undoubtedly founded on correct principles, inasmuch as the greater excess of oil permits the stiffening up process to proceed without danger of dry lumps of pigment separating out. A survey of the current market prices of dry white lead and linseed oil will usually indicate to a shrewd buyer whether it is well for him to take special precautions that the consistency of his ground white lead is right. Another important point which arises is that the condition of ground colours after prolonged keeping is often an excellent criterion of their intrinsic value. For example, when they assume a hard or brick-like consistency after keeping they may be set down as defective or abnormal in some way. Similarly a varnish which instead of clarifying becomes cloudy or gelatinous or fatty on keeping may be set down as dangerous and defective.

NEW WALLS.

The danger and difficulties arising from painting on new walls are dealt with under various headings, *e.g.*, ALKALI, POROSITY, etc.

Nibs.

When a varnished surface exhibits a number of small specks of solid matter which cannot be set down to dust derived from the atmosphere but are derived from the varnish itself, they are termed "nibs." As a rule they consist of minute specks of solid matter which may be due either to the presence of suspended solid matter in the varnish (owing to lack of proper filtration, tanking, or ageing) or to minute pieces of hard resin which have crystallised out of the varnish. It is not uncommon in the case of certain varnishes to find that even after prolonged tanking portions of the less soluble constituents of the varnish crystallise out in this manner. and unless they are removed either by mechanical filtration or by prolonged ageing in tanks, the result will be a varnish which will not give a uniform lustrous surface. They can usually be readily detected by pouring an average sample of the varnish under examination on a piece of clean transparent glass or by dipping a long piece of clean glass into the can and observing whether nibs can be detected on the film.

Non-Drying of Paint

(See Drying).

O

OBSCURING POWER
(see OPACITY).

OIL TEARS OR STAINS.

This defect, which is found on surfaces finished both with flatting and with certain water paints, is discussed under GUMMY EXUDATIONS.

OPACITY.

Opacity is the property whereby paints obscure the surface to which they are applied. "Hiding power" and "obscuring power" are terms which are used to describe the same thing, and popular and less satisfactory synonyms are "body" and "covering power." The opacity of a pigment depends upon a number of factors, fineness of the particles and physical condition being among the chief. The opacity of a paint depends not only on the opacity of its pigmentary constituents but also on the liquid medium in which the pigment is suspended. Thus the opacity of white lead varies according as it is suspended in oil or turps, and that of whiting according as the vehicle is oil or water. Questions relating to opacity often involve a consideration of complex optical laws, and complaints on this score are not infrequently the result of careless or imperfect workmanship.

Opening Paint.

Painters apply the term "opening" to the process whereby paint materials are reduced in viscidity in order that it may acquire better spreading properties. Thus a heavy-bodied flat paint can be "opened out" by means of turpentine or a paint which is too "round" can be opened out by means of raw linseed oil. It should always be remembered that opening out paint for the purpose of increasing the ease of application may result in reducing certain other qualities of the paint to the detriment of its wearing properties. Here again a sharp distinction should be drawn between decorative paints and protective coatings. The latter should never be "opened" indiscriminately.

Over-Graining, Cracking of.

The whole technique of graining is so specialised that it is impossible to formulate cut and dried rules or theories regarding the defects which are met with in this class of work. Every practical grainer has his own pet methods, and the methods used by grainers to temper their colour border on the mysterious. Hence enquiries having for their object the detection of the cause of defects in graining work must necessarily be accompanied by a precise knowledge of the process employed and the nature and composition of the materials used. Speaking in the broadest possible manner, racking in over-graining may be set down to unequal expansion and contraction of the top and under films, but as to the precise mechanism of the defect nothing can be alleged until each particular problem has been investigated on its merits.

P

PAINTERS' HOLIDAY.

This popular term is employed to indicate that variety of scamping which consists in omitting to cover certain isolated portions or whole stretches of a surface. It is of course chiefly met with in work carried out by extremely careless, inefficient or dishonest contractors, and a qualified and experienced Clerk of the Works or Architect can always detect it. Work which has been carried out at night often shows this defect. The use of different colours for each coat is a device which some architects adopt in order to detect 'skips,' as the defect is sometimes styled.

PAINT REMOVERS.

There are three practical methods in use for removing paint :—

1. Burning off by means of a blow lamp.

2. Rubbing down by means of pumice stone, sandpaper, steel wool, or some other abrasive material.

3. The use of some material which will soften and remove the paint by a chemical process. But the materials included in class 3 can be further sub-divided in two main classes :—

a. Alkaline paint removers.

b. Spirituous paint removers.

The materials described as "Alkaline Paint Removers" owe their efficiency to the presence of a strong alkali (which is usually caustic soda) held in suspension by some inert material, such as china clay, starch, whiting, or the like. A powerful "remover" consists of slaked lime reduced to a pulp with water and mixed with an inert material, and probably strengthened with a solution of caustic soda. The alkaline materal saponifies the oil in the paint forming a soft mass which can be readily removed by means of a scraper or broad-pointed knife. Surfaces so stripped should be carefully washed down with warm water after the decomposed paint has been scraped off, and the last trace of alkali on the work should be neutralised by washing with water containing a small proportion of acetic acid, care being taken, however, that the proportion of acid is not overdone. Quite a number of complaints as to bad drying, softening, loss of gloss, etc., in varnished or painted work are traceable to the varnish or paint having been applied over a surface from which the alkali had not been thoroughly removed. The use of alkaline paint removers must therefore be regarded as a more or less rough and crude method for removing paint and should not be adopted in the case of fine work, especially on doors and woodwork on which good timber has been used, or in the case of mouldings which offer a lodgment for the alkaline matter in the quirks and crevices. "Spirituous paint removers" have not yet come into such wide favour as their virtues would appear to entitle them to. Their action in softening paint and varnish films depends on the solvent action of certain liquid materials, such as fusil oil, acetone and certain other spirits of a more complex nature. Various proprietary materials of this class are on the market, and their use is to be recommended. Care should be

taken that the inflammability of the material is understood, some of them being exceedingly volatile and dangerous. It is not difficult for a practical man to make himself acquainted in a short time with the specific properties of one or other of the spirituous paint removers now on the market, and although they are more expensive than the alkaline paint removers, they are much more effective in practice, and are free from many of the defects which the alkaline removers labour under. One great virtue of the best of the spirituous removers is that they are more under control than the alkaline materials. Thus it is possible to remove the varnish from grained work without disturbing the graining at all, nor do they discolour natural wood like the alkaline preparations.

PAPER, COLOURED LINING
(See LINING PAPER).

PAPER, DISCOLOURATION OF.

Wallpaper is liable to be discoloured :—

1. By the action of alkali or other chemical matter in the wall.

2. By the action of moisture, which, under certain conditions, generates fungoid growths. (See FUNGOID GROWTHS.)

3. By the action of light which exercises a severe influence on wallpaper, particularly when the colouring matter in the wallpaper is in the form of a more or less fugitive aniline dye. The action of light is intensified during the process of drying of the paste, and consequently when tinted lining papers, ingrain papers, or other papers tinted in the pulp and not by means of surface pigments are in question, paste should be applied as thinly as possible and good ventilation should be ensured during the process of drying.

Paper, Ingrain
(See Ingrain Paper).

Paper, Lack of Adhesion of.

It is not uncommon to find that paper is completely thrown off the surface on which it has been pasted owing to lack of adhesion between the paste and the wall. This phenomenon usually takes place when an impervious surface is in question, as for example when a damp wall has been treated with a damp resisting preparation or when the wall has been previously treated. In such cases the risk of lack of adhesion is minimised by applying to the paper a very thin coat of paste of a quick-setting tenacious variety. This is especially necessary in the case of papers which are liable to be damaged by the paste soaking through into the fabric of the paper. It is obvious that when paper is applied to an impervious surface the moisture in the paste cannot escape towards the back but is absorbed into the body of the paper. Cases of bleaching of ingrains and other troubles of a chemical nature are especially common when impervious surfaces have to be dealt with.

Paper, Old.

It is a good rule not only from the point of view of sound craftmanship but also for sanitary reasons, invariably to strip old papers from walls before either painting or re-papering them. Walls so stripped have frequently to be carefully prepared before paint or distemper can be applied satisfactorily for the reason that the remains of size and paper-hangers' paste remaining on the wall are frequently washed into the surface of the plaster causing great variations in

porosity. It is not a bad plan to commence the preparation of old papered walls by applying a coat of some suitably prepared flat zinc paint after the wall has been cleaned, preparatory to further treatment.

PARA-NITRANILINE.

The base of a group of lake pigments described as permanent and fast reds and used as substitutes for vermilion. They are also used in printing inks and for other special purposes. (See BLEEDING and BLEACHING OF REDS).

PARA REDS.

A popular term for a group of lake pigments derived from para-nitraniline.

PATCHES.

Every properly prepared and finished piece of paint or distemper work should be "solid" when it is completed, and anything of the nature of patchy work is to be condemned. A patchy surface indicates either something seriously wrong with the workmanship or in the specification to which the contractor has worked. (See SHEARY, SINKING IN.)

PATENT DRIERS.

By this term is indicated that class of materials in the form of paste which are used to communicate drying properties to paint. The word "patent" has lost all practical significance in this connection, and as a class "paste driers" (to use a term which is descriptive of the materials referred to) are now held to be more

or less obsolete materials. A full technical discussion on this point would be beyond the scope of this work, but it may be of advantage to point out that in order to be of practical utility as a drying agent a drier must be soluble in linseed oil. The solubility of the drying agents commonly used in the preparation of paste driers is very slight at low temperatures, and consequently in order to obtain noticeable results a large excess of the drier must be introduced into the paint. This has two objections :—

1. The excess of drying material will *sooner or later* have some deleterious effect on the linseed oil, and will probably tend prematurely to destroy the elastic and wearing properties of the paint film.

2. Owing to the very dilute form in which the drying agent is introduced a large mass of inert, useless, or possibly actively harmful material is introduced into the paint. Patent driers frequently contain in their pigmentary portion as much as 95 per cent. of absolutely inert and valueless material, usually barytes or Paris white or a mixture of the two. It is, therefore, absurd for a paint user to specify that a certain paint shall consist of pure white lead, pure linseed oil and pure turpentine, if at the same time he permits the introduction of an arbitrary proportion of patent driers of unknown composition. It is too much to say that patent driers should never be used, but on the other hand it is true that in nine cases out of en better results would be obtained by the use of a properly standardised and scientifically compounded liquid drier. Patent driers usually contain water and very often free acid and are frequently the cause of cracking, loss of gloss and perishing in paint.

Peeling of Paint
(see Flaking).

PENETRABILITY OF PAINT FILMS
(See PERMEABILITY OF PAINT FILMS).

PERISHING.

This term is applied to paint films which have become porous and useless as protective coatings. Perishing is often, but not necessarily, associated with flaking and powdering. It is frequently associated with oxide of iron paints, and is usually due to the destruction of the oil. Too much drying material hastens the action, as also does turpentine or other volatile solvent. Perishing is assisted by a badly ground pigment, the particles of which perforate the oil film. Moisture is thus admitted, and the paint quickly shrivels or cracks and ultimately becomes porous over the whole surface, when it may be said to have perished.

PERMANENCE OF COLOURS.

A clear distinction should be drawn between the terms "permanence" and "durability." It would tend to simplicity if the term "permanence" were confined to pigments. Thus it is a matter of common knowledge that the permanence of Dutch pink is inferior to that of yellow ochre and that the permanence of chromate of lead is inferior to that of chromate of barium. On the other hand the term "durability" is perferably restricted to paints, and the durability of a paint is determined by the permanency of its several constituents coupled with other chemical and physical factors. A full discussion of the relative permanence of various pigments is impossible in a work such as this, and reference should be made to one or other of the well-known technical manuals on the subject. It is

customary in the colour trade to draw a distinction between "fast" and "permanent." The former term implies permanence to light only. (See Durability.)

Permeability of Paint Films.

This term is employed to designate the degree to which the outer or "weather" film of a protective paint resists the tendency of moisture to penetrate it. The greater the resistance of the film to the penetration of moisture the greater will be its utility as a protective coating. Opinions differ as to whether it is the pigment or the vehicle which exerts the greater influence in imparting to a paint film its real protective properties, and the truth would appear to be that both the solid and liquid ingredients play an important part. Even the most impermeable paint film tends in time to become permeable owing largely to the destructive action exerted by oxygen and the weather on the linseed oil contained in the paint. Experiments have proved, however, that *up to a point* the greater the proportion of pigment which can be introduced into the finishing coat the better will the latter resist the action of the weather, always provided that the pigment is properly selected and possesses the correct physical properties. A film of linseed oil gradually becomes permeable by moisture even although the oil may not actually perish, and consequently, many experts hold that the oil or varnish medium in protective paint films ought to be strongly reinforced by pigmentary matter in order that the film may possess the maximum amount of impermeability.

PIN-HOLING.

This defect is chiefly met with in varnished work, and is due to varnishing over a greasy, damp or oily surface. It may also be caused by applying an elastic varnish over too hard and impervious a ground. Rubbing down and re-varnishing is the only remedy. (See CISSING.)

PITCH PAPER.

This is paper of a special nature coated on one side with a thin preparation of pitch. The paper is chiefly used under wallpaper on walls suspected of being damp. The practical difficulties met with in fixing such papers are referred to under "damp walls" and "lead foil."

PITTING.

In general the term "pitting" as applied to varnished work is synonymous with pin-holing.

PLASTER.

The various conditions met with in plaster and which affect painting work are dealt with under the headings *alkali, moisture,* etc. It should always be remembered that plaster, considered as a paintng ground, is a material liable to wide variations in nature and properties, and the skilful and experienced craftsman will always consider the ground on which he has to apply paint before proceeding with his work. Plaster may be divided, in a rough and ready way, into lime plaster and plaster of the nature of cement, the latter including what are usually known as quick-setting or

patent plaster (Sirapite, Granitic, etc.) The main differences between these two classes are that in the case of lime plaster the active chemical matter is almost exclusively confined to hydrate of lime, and the surface is very much more porous than that presented by the quick-setting plasters. In the case of the quick-setting, cement-like plasters the surface is more or less impervious, and the skill of the painter has frequently to be directed towards obtaining a suitable key on which to apply paint. The chemical action exercised by the cement-like plasters is usually severe, and strictly speaking they should not be painted on until they have stood six months. It may be noted that there are now on the market quick-setting smooth faced plasters which are practically inert towards colouring matter and which do not effloresce.

Pointing.

It is a mistake to imagine that anything of the nature of paint is capable of entirely remedying structural defects such as defective or damaged pointing and the like. It is therefore necessary before an outside wall is painted either with a view to securing decorative results or in order to prevent damp striking through to see that the pointing is in good condition. It should furthermore be borne in mind that new pointing implies new mortar or cement, and the joints between bricks may frequently contain active chemical matter. Under conditions such as these the whole wall must be regarded as a new structure, and the painting methods must be adapted to conform to these conditions.

Poisonous Paints and Pigments.

It is a moot point how many pigments could be

classed as strictly non-poisonous. At the same time there are undoubtedly a certain number of pigments which are without question highly poisonous, and the modern tendency appears to be to employ as far as possible pigments which possess toxic properties in the smallest degree.

For many years past there has been a growing appreciation on the part of the public of the poisonous nature of white lead, and the growth in popularity of enamels and washable and sanitary distempers can, without doubt, be traced to a considerable extent to a wish on the part of the public to adopt paints which can be described as sanitary and hygienic. It is many years since pigments containing arsenic were tabooed by the general public. The old-fashioned arsenic greens are seldom met with now either in painting or in paper staining, and the only class of paints which contain copper-arsenic pigments are anti-fouling compositions, in which certain poisonous properties are essential. White lead, red lead, sulphate of lead and the lead chromes must be regarded as poisonous pigments, and in view of possible legal enactments, having as their object the restriction in the use of poisonous pigments, it would be well for every practical painter to make himself acquainted with pigments of an innocuous character which can take the place of the foregoing poisonous materials.

POROSITY OF PAINT FILMS
(See PERMEABILITY OF PAINT FILMS).

POROSITY OF SURFACE.

All surfaces which have to be painted must possess a certain amount of porosity in order that the paint may lie on and adhere to them. Glass is

the type of a surface which is non-porous and possesses no key. Excessive porosity is, however, detrimental and it is frequently necessary in the case of plaster walls, stone, brick, etc., to adopt a special treatment before proceeding with the painting proper in order to reduce porosity and to obtain a surface which will enable the paint to bear out properly. The manner in which this can be accomplished necessarily varies, and reference is made to the usual methods and difficulties in various sections in the book.

Powdering Distemper.

This is due to the perishing of the size or other binding medium. All size colours are in the course of time liable to the defect of powdering or flaking.

Priming.

Inasmuch as priming coats of paint have to withstand all the destructive conditions inherent in the surface which they cover and have to provide a suitable foundation for succeeding coats of paint, it is of the utmost importance that they should be selected and applied with care in every case in which thoroughly good and durable results are desired. The merits of red lead as a drying agent and as an opaque bodying up pigment have led to extensive use of this pigment as an ingredient of priming coats, and the old-fashioned priming applied as the first coat on woodwork consisted of a mixture of red and white lead and linseed oil with very little, if any, turpentine. A mistake many painters make is to apply priming on woodwork too sharp, *i.e.* containing an excess of turpentine. This is not only a costly mode of procedure (as a considerable quantity of the turpentine

volatises into the air), but it is distinctly wrong for the reason that the red lead being unsatisfied by a sufficiency of linseed oil in the priming is left in an unprotected and voracious condition towards the oil in the next succeeding coat. It is no uncommon thing to find the red lead priming coat which has been starved of linseed oil eating into and showing through several coats of white lead and several of enamel. The practical rule, therefore, if red lead priming is employed is to ensure that it is of an oily nature. If for any reason the practical man decides that a priming of a sharp or flat nature should be applied, then red lead should not enter into its composition. With modern materials at the disposal of painters and decorators, there is less reason now than formerly for the universal use of red lead in priming coats, and in many cases it is quite easy to design primings both for house painters' and engineers' use, which are entirely innocent of this pigment, which possesses the disadvantage of being poisonous.

PRUSSIAN BLUE GOING TOUGH
(See CURDLING, FEEDING UP, LIVERING).

PRUSSIAN BLUE SPOTTING
(See BLUEING).

PUMICE STONE.

Pumice Stone has for a long time held a well deserved reputation as an abrasive material for the rubbing down of work which has to be painted and for the rubbing down to a perfectly smooth surface of coats of paint prior to further applications. There is no economy in purchasing cheap pumice stone, because the latter frequently contains pieces of grit which

scratch and damage the work. A piece of pumice stone should be selected and taken care of in the same manner that a properly trained painter takes care of his brushes and sponges. Artificial pumice stone, as it is termed, is now sold to painters for rubbing down purposes. It consists of pumice stone ground to varying degrees of fineness and compressed under great pressure into blocks of suitable size. These are very convenient, and a range of blocks can be selected, the texture of which varies from that of a hard grainless marble to that of rough sandstone.

Purity of Colour.

Every colourist is familiar with the undefinable beauty possessed by a fine sample of emerald green or lemon chrome or vermilion. There is a characteristic colour effect produced by such pigments which is familiar to everyone who has handled them largely. When coloured pigments are reduced with white there is a marked variation in the tones or shades of colour which result, and the nearer the reduced colour approximates in general colour effect to that of the undiluted pigment the more is the reduction said to possess purity of colour. A full and scientific analysis of the intrinsic hue possessed by undiluted pigments and reductions of the same either by white or by other pigments can only be worked out by the use of some optical method such as that associated with the Lovibond tintometer, and it is impossible to go deeply into the question here. It is a well-known fact, however, that the tones and shades produced by the admixture of oxide of zinc with coloured pigments are purer than those produced by the admixture of white lead with the same coloured pigments. From a decorative point of view this is not always an

advantage. The most decorative tints are usually those which partake of the nature of tertiary colours. Thus the addition of black will often make a clean uninteresting tint decorative. A scheme of decoration which strikes the observer as harsh and blatant will usually be found to consist of colours which are too pure. It is obvious of course that in decoration as in other arts the result must depend largely on the genius and intuition of the artist.

PURITY OF MATERIALS.

Modern ideas regarding the composition of paints have undergone a great change during the last 10 or 15 years, and it is no longer regarded as essential, or even advisable in many cases, that a paint should consist of two or three so-called pure materials in order to render it effective for its purpose. While this is true, it cannot be denied that the user of paints or paint materials has a right to get what he asks for, and consequently if he demands pure white lead or pure oxide of zinc or pure linseed oil he ought to get it. With regard to protective qualities it is now held that a mixture of several pigments and vehicles produces better results than a mixture consisting of one straight pigment and straight linseed oil and turps. The term "straight" used in this connexion is an appropriate Americanism which has come to be largely adopted in the paint trade. "Straight" turps means undiluted American spirits of turpentine, straight linseed oil means undiluted commercially pure raw linseed oil, and so on. Modern paint technology has proved that straight linseed oil is not the ideal vehicle for protective paints, and that better results are obtained by the use of linseed oil which has been treated and mixed with other vehicles in ways

which have to bev aried according to the purpose for which the paint is required.

The whole question of pure paints is one on which there has been and is still a good deal of controversy, and it is unwise to dogmatise. It is safe to say, however, that practical results in service have shown that a paint consisting of a carefully adjusted mixture of pigments ground in and thinned with a composite medium, the nature and proportion of which has been carefully adjusted to suit the pigments in question, gives better results than the old-fashioned straight paints.

Putrid Size

(See Size).

Putty, Fish Oil in.

It is questionable whether the term "putty" implies any precise composition, but it is more than probable that the term "pure linseed oil putty" could be held to denote only a material consisting of nothing but genuine raw linseed oil and whiting. During periods when linseed oil is high in price all sorts of expedients are resorted to by ingenious manufacturers in order to cheapen the cost of the raw materials used in the production of putty, and unfortunately a certain class of contractors is met with who are only too ready to avail themselves of questionable procedure of this kind. In order to cheapen the cost of putty two expedients are resorted to :—

1. The introduction of a liquid vehicle cheaper than linseed oil.

2. The introduction of solid pigment which requires a smaller percentage of oil than whiting in order to reduce it to the consistency of paste.

When the first procedure is adopted deodorized fish oil, rosin oil, mixtures of mineral oil and linseed oil are employed, and in the second case a proportion of barytes is used along with whiting. The latter procedure always results in the formation of extremely "short" and unsatisfactory putty.

PUTTY LOOSENING.

Although putty is usually regarded as an extremely common-place article there are nevertheless certain well-known principles in its manufacture. The chief object in using putty is to provide an elastic yet firm bond between wood and glass, but it is also used as a stopping or filling for nail holes, cracks and the like. Properly made putty ought to harden uniformly throughout the bulk. If it contracts during the process of drying, it will most probably come away from one or other of the surfaces within which it is contained. Inferior putty is liable to contract during or after the process of drying. The presence of barytes in putty makes it 'short' and brittle. Rosin oil or fish oil detracts from its drying and hardening properties.

Quick-Drying Materials, Defects of.

It is a general rule and a fairly safe one to follow that the property of excessive speed in drying can be communicated to a paint or varnish only at the expense of some other property or properties. In the case of materials which owe their drying properties to the oxidation of linseed oil, excessive speed in drying is usually associated with reduced durability, which may manifest itself in a tendency to crack or to lose gloss or to become powdery, or in other ways. More latitude can be allowed in such matters in the case of materials employed under mild conditions or for indoor work than in the case of those exposed to severe conditions out-of-doors.

R

RED LEAD EATING THROUGH PAINT OR ENAMEL.

(See PRIMING.)

REDUCED, AS APPLIED TO WHITE LEAD.

The term "reduced" applied to white lead indicates that the white lead has been admixed with a proportion of some other pigment, and the mixture cannot be sold as white lead. The pigment which is invariably used as a cheapening agent is barytes. No specific percentage of reduction is indicated by the term, and buyers of reduced white lead can demand a guarantee that the reduction does not exceed so much per cent.

REDUCED RED LEAD.

In view of the clear state of the law as applied to the marking of white lead, it might be held that the term "red lead" should be confined to a material consisting wholly of red lead. The view is still current in the trade, however, that red lead admixed with cheapening materials can be sold as "red lead," provided the mixture is not described as "genuine." It is doubtful whether this view could be defended and the writer holds strongly that the term "red lead" should be confined to the unadulterated article, just as in the case of white lead, and that all admixed grades should be described as "reduced." Similar

procedure should apply in the case of linseed oil, turpentine and other standard materials.

Ropiness.

This is a most disagreeable defect met with particularly in enamels, and indicates that an enamel lies on the surface in ridges or furrows just as it leaves the bristles of the brush, and does not "flat itself out," as the painter says. Strictly speaking it must be regarded as a defect of the material, but it must not be forgotten that an unskilful brush hand may produce a ropy result even with the best material. Therefore before a parcel of varnish or enamel is condemned as being ropy it should be examined by an expert painter. The cause of ropiness in enamels is often a lack of balance between the solid and liquid ingredients. Again, the varnish medium in the enamel may have become thick or tough and so viscous as to lie in ridges on the work until it sets. A varnish which is insufficiently aged may work ropy, and as a rule when this defect is met with it is wise to investigate the materials thoroughly.

Rosin Eating through
(See Knots).

Rosin in Varnish.

If varnish is purchased at a very low price the presence of rosin can hardly be looked upon with feelings of surprise, although rosin has risen so much in price that there are on the market "rosin substitutes." It is not, however, a desirable ingredient in varnishes of good quality, owing to its tendency to cause blooming in the varnish and to cause the latter

to crack. Modern methods of varnish manufacture enable rosin to be used in a way which was impossible in the olden days, and in purchasing varnish it is best not to enquire too deeply into what the varnish contains but to find out by practical testing what the varnish will do. Personal honesty and trade reputation count for a great deal in the varnish trade. Buying varnish to specification is frequently a delusion and a snare.

ROSIN OIL.

This is a material which in its essential properties resembles a mineral oil. It belongs to the class hydrocarbon oils. Special processes are in use which convert rosin oil into a semi-drying oil, which finds a use in paints for special purposes. It is unwise for a painter to attempt to use rosin oil in mixing paint as it will undoubtedly give rise to trouble.

RUSTING

Rusting is usually regarded as that variety of corrosion which attacks iron or steel. It consists in the conversion of metallic iron into complex oxides of iron to which the general term "iron rust" is applied. Moisture is a necessary condition for the promotion of rusting. Hence if an iron or steel surface could be coated with an impermeable film of protective paint *before any moisture at all* becomes deposited on the surface rusting would be prevented. It is not possible in practice to do this, but care in the selection and application of the first coats greatly minimise the risk of rusting. Rusting underneath a paint film is a serious cause of deterioration in the latter.

Rust Coming Through.

Paint over iron work frequently becomes spotted with rust marks which evidently owe their origin to the formation of rust beneath the paint. Defects of this nature can only be prevented by very effective preparation of the iron work before painting. Every speck of rust left on iron or steel constitutes a potential source of further rusting beneath the paint. It is consequently of the greatest importance to remove the rust and to leave the surface bright and clean before the paint is applied. Special brushes and tools can be obtained for cleaning iron work before painting and the work should be painted with a priming or filling coat immediately after it has been cleaned.

Rust Induced by Certain Paints.

Certain pigments possess the property of accelerating corrosion in iron and steel, and such pigments are now eliminated from protective coatings.

For further information on this very wide and complex subject reference must be made to books and articles on the subject.

S

SADDENING DOWN.

By this is described the loss of gloss and general deterioration in the surface of a glossy paint, varnish or enamel owing to the undercoat being too soft (probably too oily). The result of this is that an absorption takes place between the undercoat and finishing coat with the result that the lustre of the latter is impaired. It may be due to a defect in the finishing coat (such as imperfect grinding or amalgamation), but is equally probably due to some defect or unsuitability in the undercoat. Enamel paints which contain too much pigment display this defect.

SAGGING OF VARNISH
(See CURTAINING and WRINKLING).

SANDY VARNISH.

Small pieces of grit in varnish or matter deposited from the varnish itself constitute a serious defect. Varnish which has not been aged sufficiently or which has been imperfectly filtered or which has been placed in dirty cans is liable to exhibit the defect. It should aways be remembered that great care is necessary on the part of the user in storing varnish, especially if the can has once been opened in order to prevent the entrance of adventitious particles of grit or dust. The presence of solid particles in varnish can always

be detected before the varnish is put into use by pouring some of the material on a perfectly clean piece of glass.

Scaling of Distempers.

Sooner or later all materials of the nature of distemper scale from the surface to which they are applied. This is often due to the presence of size or materials of the nature of size below the distemper or in the distemper itself, but it may also be due to one or other of the causes mentioned under "scaling," "spotting varnish, etc."

Scaling of Paint.

As a general rule paint scales or flakes on account of lack of cohesion between it and the underlying surface. This may occur through the natural and inevitable deterioration of the paint through long exposure, but it may also be due to some defect in the paint or in the undercoat and is also frequently caused by the presence of moisture on the surface to which the paint has been applied. The determination of the precise cause of flaking and whether it should be regarded in a specific case as a defect of the material is a matter which can often only be decided by expert examination of the work on the spot. Lack of sympathy between the finishing coat and the coat or coats beneath is a fertile source of scaling. Both chemical and physical phenomena play a part. General deterioration on account of the paint having begun to perish is often accompanied by scaling.

Scumbles.

An ideal scumbling colour is one which is more

or less transparent, as for example burnt sienna, Prussian blue, Vandyke brown and certain lake colours. Pigments which possess great opacity are as a rule unsuitable ingredients for scumbles. The pigment should be thoroughly well ground in the medium in order to remove the last traces of grit. The object of using a scumble is to apply a thin glaze of the finely ground pigment which is then partially removed often by means of a brush or comb in order to partially expose the ground beneath, and so produce a variegated effect, which may in certain cases imitate or suggest wood.

SEEDY VARNISH.

Varnish which contains minute specks of a semi-transparent nature is said to be seedy, the small specks resembling seeds. It is, of course, a serious defect in the material, and varnish exhibiting such a defect is wholly unfit for use.

SETTLING.

Mixed paint has a tendency to separate in course of time into its original component parts of solid pigment and liquid vehicle, the solid pigmentary portion sinking to the bottom. In the case of finely ground and properly amalgamated paints this tendency is reduced to a minimum, and highly finished enamel paints have been known to remain without separation of the pigment from the vehicle for a period of several years. Certain pigments possess the property of sinking or settling in paint more than others. For example native barytes possesses physical properties which cause it to settle very rapidly, and it is almost impossible to keep barytes in suspension after a limited period. The rapidity with which a paint settles

in the case of ordinary materials will be found to afford some indication as to the intrinsic quality of the material. At any rate a tendency to settle indicates either that the fineness of grinding is defective or that the physical properties of the pigment are abnormal.

SHEARY.

When a painted surface which is intended to present a uniform flat or semi-flat appearance exhibits local glossy or semi-glossy effects the work is said to be sheary. The defect is due to several causes which as a rule are incidental to the mode of preparation of the surface and handling of the material. Certain flat paints and enamels dry with a uniform flat surface if not worked too much under the brush, but excessive working will develop a certain degree of gloss. Considerable experience is necessary in order to judge the degree of gloss which should be possessed by an undercoat which has to be finished with a flat coating. If the undercoating is either too glossy or too flat, too hard or too soft, unsatisfactory results will follow, and one of these will probably be sheariness. Certain combinations of pigments and vehicles are more prone to promote sheariness than others. An experienced painter has said that flat or semi-flat coats should never be applied as if the painter were afraid of them which is tantamount to saying that the craftsman must have confidence in himself. (See also SADDENING DOWN, SINKING IN, FLASHING, ETC.)

SILKING OF VARNISH OR ENAMEL.

The appearance described as "silking," although very familiar to everyone who has handled enamels or varnishes extensively, is somewhat difficult to describe.

The surface exhibits when dry a finely lined appearance as though the varnish or enamel had tended to flow in one direction, but the lustre, hardness and other physical properties of the material are not impaired. Strictly speaking, "silking" is a defect, but it is one which is common to many first-class materials and it must be put down to a physical condition of the varnish which prevents it flatting out equally in all directions. It is frequently due to a slight lack of viscosity in the material, and it often disappears when the enamel or varnish is aged. Silking may not develop until the material has been applied for some days.

SINKING IN.

Is a similar defect to "saddening down," and may be local or over the whole surface. If local, it is not uncommonly similar in effect to sheariness.

SKINNING OF PAINT.

Every paint, provided it possesses the essential characteristics of that material, has a tendency to form a skin on the surface when exposed to air. If skin forms on the paste paint it should be carefully removed before the paint is mixed up otherwise pieces of broken skin will become disseminated throughout the bulk and laborious straining will be necessary before the material can be used. Manufacturers of paint materials as a rule exercise great care that the packages containing their products reach the consumer without any skin having formed on the surface. This result is promoted by ensuring that the package is of suitable size and that there is not too much free air space inside. If the package is too

large skins will almost necessarily form inside and much trouble will ensue. In the case of stiff paints, the painter should be careful to smooth down the surface after each successive quantity of material has been removed from the stock cask or keg. Some stiff paints (*e.g.*, white lead) may be covered with a layer of water to exclude the air, but other paints (including those which contain zinc pigments or chemical colours such as Brunswick green) should be covered with a thin layer of raw linseed oil and not with water. The raw oil does not tend to skin so readily as boiled oil and it preserves the surface of the paint in a smooth and easily worked condition. Paints that have been covered with water frequently become granular in texture and may ultimately become entirely useless.

Skips

(See Painters' Holiday).

Sleepy Paint or Varnish.

A paint or varnish is described as "sleepy" when it fails to develop or retain the amount of gloss which is properly expected from it. In most cases it is a defect of the material and the attention of the manufacturer should be drawn to it at once. The causes which promote the effect are described in other sections dealing with loss of gloss, etc.

Smoke Stains.

These may be caused by soot penetrating the surface from behind or may be due to the deposition of smoke and soot from the outside. If the former is the case it will be necessary to apply some material

to the wall or ceiling before painting or distempering is carried out. Materials specially designed for this purpose are on the market, their essential property being that of penetrating the plaster to a slight extent and forming a hard, impervious skin which keeps back the smoke or moisture which is causing the stain, and at the same time providing sufficient "key" for supplementary coats of material. In the case of soot which has been deposited from the outside, too little attention is as a rule given to the potent effects of such foreign matter. Old cement walls and buildings are frequently loaded with soot and chemical matter which makes its presence known when washing down is commenced. This deposited matter, being derived from the combustion of coal, is distinctly acid in character and has therefore a seriously destructive influence on many pigments and paints as well as on stonework itself. It has been found that ultramarine, which is usually rgarded as a stable pigment, is quite unstable when employed as a constituent of a water paint or distemper on outside fronts in London. As a rule the painting of exteriors which have become contaminated with smoke or soot calls for special consideration before the mode of treatment is decided upon.

SOURING OF PASTE.

Paperhangers' paste is liable to turn sour when left too long before being used. In a sour state it liquifies and loses its adhesive properties and the fermentation that is set up is liable to have a prejudical effect on the colouring matter in paper. In order to prevent souring preservatives such as alum, boracic acid or salicylic acid are introduced into the paste. These should not be present in too large

proportions, and it is best to use paste as freshly made as possible, not only for the reasons indicated but also on the score of hygiene.

Specifications, Vague.

It is no part of the present work to enter into the wide and important subject of specifications and specifying. It might be pointed out, however, that a good deal of misunderstanding, confusion and expense might often be avoided if the terms used in specifications and contracts were exact and unmistakable. Vague and doubtful specifications are unsatisfactory for two reasons. Firstly, they make it possible for contractors who tender for work to quote on different bases, which implies as a rule that the more scrupulous and craftsmanlike contractor is placed at a disadvantage. Secondly, they provide an opening for misunderstandings to arise in interpreting the contract, and this can only cause dissatisfaction on the part of the architect or his client. Much of the vague specifying to which unfortunately many architects are prone is due to ignorance on their part of the technique of painting and of the subject of modern paint materials. The forms of specification which are used in painters' schedules are frequently relics of obsolete modes of expression which have lost their force and which afford opportunities for misinterpretation and even for fraud.

Specific Gravity.

The determination of specific gravity is a matter which concerns the manufacturer and the paint chemist rather than the painter, but useful information is sometimes obtained by the latter if he determines the

specific gravity of certain of the materials which he uses. The standard of specific gravity is water, one imperial gallon of which at 60°F. weighs 10lbs. Hence if an imperial gallon of a certain varnish weighs 9lbs. 4ozs. at 60°F., the specific gravity of that varnish is represented by $9\frac{1}{4}$ divided by 10 or ·925.

With regard to pigments it is found as a rule that the higher the specific gravity the less oil is required in grinding the pigment into a paste. This rule, although true in a general sense, is not of universal application. Too much reliance should not be placed on the specific gravity of mixed paints, because the specific gravity is no real criterion of the utility of the paint for a specific purpose. The specific gravity of paint will depend on the nature of the pigments and vehicles employed and the proportions in which they are present. Attempts have been made to standardise paints according to their specific gravity. This method is all very well provided a limited range of pigments and vehicles is in question, but according to modern practice in which quite a number of pigments and an entirely new range of vehicles are employed in paint-making it is usually safe to leave it in the hands of the expert paint manufacturer to turn out a mixed paint with a suitable specific gravity for the purpose for which it is intended. Other physical properties besides specific gravity influence the practical working properties of paints. One of the chief of these is viscosity.

SPECKS IN VARNISH

(See SEEDY VARNISH, NIBS, BITS, ETC).

SPONGES, GRIT IN.

Some of the cheaper sponges used for washing

down painters' work contain pieces of sand or grit or even small portions of the original rock to which the sponge adhered. Such sponges should never be used for the best class of washing down, especially if the surface has been previously painted, enamelled or varnished, as scratching will almost inevitably occur. The selection of sponges is a matter of consequence, and a sponge which combines the properties of softness and toughness is an important item in the painter's stock-in-trade.

Spreading Power.

It would be convenient if this expression were confined to describing the capacity (expressed in terms of square yards of surface per unit of material) of mixed paint required to spread over a given area. The term "covering power" is often used in this sense, but as the same expression is also used to denote opacity or obscuring power considerable confusion arises. Spreading power is a term which can be used only in connection with mixed paints. It has no meaning when used in connection with stiff or semi-mixed materials or with dry pigments. The spreading power of a paint is usually expressed in terms of square yards of surface effectively covered by an agreed unit of paint, usually a gallon or a cwt. In estimating the cost of paint work it is essential to be able to estimate with exactness the amount of material which will be required to effectively coat a given area. Manufacturers of most of the well-known prepared paints are usually able to supply data as to the spreading capacities of their products under normal conditions. In comparing the ultimate cost of different pieces of painting work carried out with competing materials the respective spreading powers of the materials are important factors, and the scale

may readily be turned in favour of a material which at first sight appears to be the more expensive. Thus an enamel paint which covers 100 square yards per gallon and which costs 12s. 6d. per gallon will be in reality cheaper than one whose spreading power is 85 square yards per gallon and which costs 10s. 9d. per gallon.

STAGNATION OF AIR IN DRYING
(See DRYING).

STAINS, DAMP
(See DAMP WALLS).

STOPPING FALLING OUT.

The filling of cracks, nail-holes and other inequalities in the surface by means of "stopping" before painting is a matter of the greatest importance. Skill and experience are necessary in order to select the most suitable stopping for use under various conditions. The general rule to observe is to select as a stopping a material or mixture of materials which will neither expand nor contract after it has set hard and which will provide a suitable surface to take the material which is to be applied over it. Well-known materials used for stopping purposes are linseed oil putty, white lead putty, mixtures of white and red lead, Keen's cement, Parian cement, powdered slate, and a variety of materials well known to house painters, coach painters, engine painters, and other craftsmen in various directions.

STRETCH.

This is the painters' term used to describe that

part of an unbroken surface which he can reach with his brush and on a wide flank wall it measures as a rule about two feet. Under certain conditions, such as exceptional porosity on the surface or too rapid drying of the paint, it is sometimes possible to detect the edge of each stretch when the work is finished. This is a defect which may be due to the workmanship or to the conditions under which the paint was applied or to the material itself or to a combination of two or more of these factors. Want of suitable preparation of the surface is often the fundamental cause of the edges of each stretch showing.

Substitutes.

The term "substitute" in paint nomenclature has acquired a somewhat unfortunate significance as indicating a material of inferior quality used in place of a standard article. Thus for example certain white pigments are spoken of as "substitutes" for white lead, and a group of volatile mineral oils are described as "substitutes" for turpentine. It frequently happens that the material described as a "substitute" is really better for certain purposes than the material which it supersedes. Thus oxide of zinc is in no sense a substitute for white lead if the pigment is intended for use in an enamel. Again certain chemical reds are not in reality substitutes for vermilion but are in point of fact superior to it in a variety of properties. The term "substitute," therefore, should be used with discrimination, and the expression "alternative" is in many cases preferable.

Suction.

A certain amount of suction is advantageous and

indeed indispensable on any surface which has to be painted as it enables the paint to penetrate a certain distance into the surface and promotes firm adhesion. Excessive suction, however, is to be avoided, and one of the first points to be attended to in preparing a surface for painting is that of stopping excessive suction. The methods whereby this can be accomplished are familiar to practical painters and may consist of the application of an oily or a sharp coat according to the nature and condition of the work. The use of size for the purpose of stopping suction is general, but this material should be avoided as much as possible as it cannot be regarded as an efficient substitute for a true paint material. (See POROSITY OF SURFACE).

SWEATING.

This word is used in a variety of senses. Walls which exude moisture are said to "sweat," and the same expression is used to describe condensation of moisture on walls. Paint is said to sweat when it becomes soft and pulpy owing to chemical action taking place from beneath. Paints which contain mineral oil or rosin are extremely liable to exude drops or tears of oily matter, and are then said to sweat. "Sweating" is also the trade term for a particular defect associated with French polish which is no doubt due to the presence of excess of oil beneath the polish.

T

Tackiness.

Tackiness is the term used to describe that slightly sticky feeling which is characteristic of paint and varnish films during the process of drying. Before anything of the nature of a skin has formed on the surface the paint is described as "wet," but as soon as a skin has begun to form the surface is described as "tacky," and the tackiness becomes less and less until the surface has dried hard. Tackiness prolonged unduly may be due to defects in the material or in the surface or to local conditions. (See Drying).

Tar Eating Through.

Tar is a very unsatisfactory material to paint over. It invariably contains materials of an acid nature (cresylic and carbolic acids) which discolour and decompose paint applied over it. Tar acids have been known to eat through as many as five or six coats of white lead paint. When the tar coating is old and has lost practically all its liquid constituents it is sometimes possible to paint over it if a priming coat

of oxide of zinc well bound with a hard quick-drying gold size is applied in the first instance. A preferable and indeed in many cases the only satisfactory method of treating tarred surfaces before re-painting is to coat them with shellac varnish, and even this procedure is not in every case attended with perfectly satisfactory results.

TARNISHING
(See BRONZE TARNISHING).

TEARS ON FLATTED WALLS
(See EXUDATIONS).

TEMPERATURE.

Temperature produces, apart from its direct action on drying, important physical results. It is commonly believed that enamel or varnish applied at a temperature above the normal works more easily than at lower temperatures. In practice this is not always ound to be the case for the reason that at the higher temperature there is a greater evaporation of the volatile material in the enamel or varnish, and consequently the latter begins to pull and drag. Hence unless the material is poured from the bulk into the paint pot or varnish pot in small quantities at a time, the bulk being carefully corked up, the gain in ease of working due to the higher temperature will be counterbalanced by the reduced fluidity due to loss of spirit. Distempers and water paints are also greatly affected by temperature owing to the rapid evaporation of the water which they contain. Temperature is one of those local conditions which must never be lost sight of in considering defects in painters' work. (See HUMIDITY.)

Terebine.

Terebine is the trade name applied to composite liquid driers. These consist chiefly of turpentine or white spirit or mixtures of these solvents in which specially prepared drying agents have been dissolved. Modern developments in varnish-making have resulted in the introduction of a great number of terebines and liquid driers. Some of these are extremely good but others are so severe in their action that it is dangerous to use them except with the greatest caution. It is a good rule when purchasing a terebine to determine once and for all its drying strength by adding small quantities (say, 1, 2, 3, 4 and 5 per cent. respectively) to a definite quantity of raw linseed oil and noting the time which the mixtures take to dry. Having determined the proportion necessary to enable say one pint of linseed oil to dry in 12 hours, it is easy to calculate how much of the driers should be added to various volumes of paint in order to "speed up" the drying. Terebine should not be confused with *terebene* which is a material derived from coal tar. (See Curdling, Feeding up and Livering).

Thickening of Paints

(See Feeding Up).

Thin Coats of Paint.

It is a mistake to apply paint in too thick coats, as these dry with difficulty and are not so durable and do not protect the surfaces so well as a greater number of thin coats. Unfortunately the question of cost of application is at the root of most of the cases in which too thick coats of paint are applied. It is obvious that it costs much less to apply a given quantity of

paint in one layer than the same quantity of paint in two or more layers. It is instructive to observe the conventional practice of the trained coach-painter in this matter and to note how he applies coat after coat of thin layers of colour and varnish rubbing down between each coat, and how he secures a result which for finish and durability cannot be excelled in any branch of the painting trade.

THINNERS.

Thinners is the general term applied to any liquid or mixture of liquids used for mixing with stiff paint in order to produce a mixed paint or for "opening" and increasing the fluidity of mixed paints. The thinners in paint exert just as much influence on the result as the pigmentary portion, and it is futile to take extreme precautions in the selection and preparation of the pigmentary part of a paint if the thinners are selected and introduced indiscriminately. Perhaps the thinners on which most misapprehension exists are those of the volatile spirituous class. The standard material of this nature is American turpentine, but of late years a number of substitutes for that material have come into use, some of them extremely efficient and economical, others unfortunately very unsatisfactory. Many painters confine their examination of a turpentine substitute to removing the cork from a sample phial and sniffing at the contents. This method of examination hardly goes far enough. There are undoubtedly many purposes for which a really well-prepared turpentine substitute can be employed with perfect success. It should never be forgotten that the greater bulk of the spirituous portion of a paint is ultimately evaporated into the atmosphere, and provided there is no ingredient in the spirit

which acts deleteriously on the paint there is no valid reason why an expensive material like turpentine should not to some extent at least be supplanted by materials of lower cost. One cannot dogmatise on the subject and an open mind on the matter is advisable. Varnish manufacturers and others now use large quantities of turpentine substitutes which for certain purposes may be safely relied upon to give excellent results. No varnish manufacturer would think of using such a material without having first subjected it to a vigorous examination and practical tests in order to prove its utility and freedom from practical objections.

Tooth in Paint

(See Fineness).

Tough Enamel.

Enamel which is too viscous and which is lacking in fluidity and which therefore requires too much wrist work in spreading it is termed "tough." All enamels possess the property of toughness to a certain extent, and it is a mistake to seek for an enamel which works too freely. On the other hand excessive toughness is a defect and one which the workman will not be slow to point out. Should an enamel prove to be too tough and should it become absolutely necessary to ease it, the latter operation should be carried out with discrimination. It is usually best in such cases to consult the manufacturer of the enamel and to ask his advice as to the most suitable thinning medium. According to the nature and composition of the enamel the thinning material will have to be varied, and in many cases it is undesirable to tamper with the material at all.

TRANSPARENCY.

Transparency is the opposite of opacity (see OPACITY). In certain cases pigments are selected for their transparency, *e.g.*, in scumbles, glazes, stains and the like in order to obtain a particular decorative effect. A pigment may be rather transparent and yet possess high staining power. The introduction of a white base reduces transparency.

TURPENTINE.

In the days when hustling was unknown and painting was carried out in a more leisurely manner than is possible now turpentine was not only in general use as a diluent or vehicle but was regarded as a drier as well. Since the advent of more modern drying agents its importance in the latter capacity has decreased, but none the less it is still one of the chief raw materials used by painters. Genuine oil or spirits of turpentine should be bright and colourless and should possess a pleasant non-pungent odour. Poured on blotting paper it should evaporate entirely leaving no mark or stain. Exposed in a shallow dish it should evaporate completely without leaving a viscous sticky residue. Freedom from adulteration with white spirit and volatile oil and spirits derived from the distillation of pine wood and refuse can only be satisfactorily established by chemical and physical examination by a chemist.

U

Undercoats, Faults In.

Under various headings have been noted some of the faults to which paint undercoats are liable, *e.g.*, softening, excessive hardness, lack of key and the like. It is important to bear in mind that undercoats play an important physical or mechanical part in connection with painting work. On the one hand they must adhere firmly to the surface beneath, otherwise flaking, cracking or blistering may result or the whole of the paint coats may be thrown off. On the other hand they must not be too hard and impervious, otherwise the finishing coats may scale or crack. Too little attention is often given to the undercoats, especially in protective painting. In point of fact the nature and mode of application of the undercoats are of vital importance if real durability and protective efficiency are desired.

Uneven Drying

(See Drying).

Uneven Suction

(See Suction Porosity).

ULTRAMARINE CHANGING COLOUR.

Ultramarine is sometimes spoken of as a very stable pigment, but conditions are quite common which render ultramarine by no means stable. Thus ultramarine withstands the action of alkalies well and is therefore a safe and satisfactory pigment for use in distempers, which are often used on surfaces containing a quantity of alkaline matter. Ultramarine however is readily acted upon by acids and is decomposed by them, hence it is an unsafe and unstable pigment in situations exposed to acid vapours or fumes. This has been proved over and over again in London where distemper tints containing ultramarine as a constituent have changed materially in hue when exposed to the air owing to the destructive action of the acid contained in the latter on the ultramarine. It should always be remembered that ultramarine contains sulphur, and that should the pigment become acted upon by acid sulphuretted hydrogen will be produced. Any pigment which may be present and which contains lead will then become affected by the sulphuretted hydrogen. We have here one of the many instances of the fact that the terms "permanence" and "stability" as applied to pigments are only comparative ones.

V

Vandyke Brown not Drying.

The pigment known as Vandyke brown possesses poor drying properties and in many cases actually retards the drying of linseed oil. Paints containing Vandyke brown must be carefully adjusted as to their drying properties. A good deal of the Vandyke brown now sold in the colour trade is by no means identical with the original Vandyke brown which was a species of brown bituminous earth. S me of the modern Vandyke browns are artificially prepared products which resemble the original only in name. Some people say that Vandyke brown induces blooming in varnish applied over it. Whether this is so is somewhat doubtful, and the writer is inclined to think that the cause of blooming which is sometimes met with when Vandyke brown is in question is due to other causes as, for example, the presence of traces of alkali derived from the materials used in the fabrication of some of the modern so-called Vandyke browns.

Varnish Turning White.

The effect known as "turning white" in varnish, may be simply a special case of blooming or fogging on the surface or may be due to the direct action of moisture on the resin in the varnish. Certain of the resins used in the manufacture of varnish are more susceptible to this action than others. Consequently varnishes intended for exterior and in particular marine use must be made from selected materials and

manufactured in a particular way. It does not always follow that when a varnish turns white in the presence of moisture it will wea · badly, but the defect is unsightly and should be guarded against as much as possible by the use of suitable materials, which should be applied to a perfectly dry surface. (See BLOOMING).

VENTILATION

(See CONDENSATION and DRYING).

VERMILIONETTES.

This is the name of a class of lake pigments of brilliant red and carmine tones produced by precipitating eosin on a base of red or orange red or some other suitable base. It has no connection chemically with vermilion. Vermilionettes made from eosin are now regarded as extremely fugitive pigments, and their place has largely been taken by lake pigments of other classes.

VERMILION, BLACKING OF.

Vermilion consists of sulphide of mercury, a material which exists in two distinct physical modifications, the red sulphide (vermilion), and the black sulphide. The latter is the more stable form, and under the influence of certain conditions the red sulphide reverts to the more stable black sulphide. When this occurs on a surface painted with vermilion we have the familiar phenomenon of blackening. Certain makes of vermilion are more liable to blacken than others owing, no doubt, to some physical condition present in them. It has been found that blackening is impeded by applying the vermilion in the form of "sharp colour" which should be varnished over as soon as it has dried hard, so that it is

exposed as little as possible to the air. The grinding of vermilion in a liquid medium is always a delicate operation. If too much pressure is employed or if the grinding is continued for too long a time the pigment will lose its brilliance. Vermilion possesses physical properties which render it by no means an ideal pigment for admixture with a vehicle, and for the above-mentioned reasons it has come to be largely superseded by lake pigments which are known as permanent reds. These permanent reds, although superior to vermilion in certain properties, are inferior to it in others, and it therefore comes to be a question of considering the conditions to which the paint will be exposed before deciding whether vermilion or a permanent red will be the more satisfactory.

Viscidity.

Viscidity is a less exact term than "viscosity," and is for that reason preferable to it for popular use as it describes the viscous or viscid properties possessed by a liquid or semi-liquid without introducing the complications involved by using the term "viscosity" which ought to be confined to a definite physical property.

Viscosity.

This is the physical property possessed by liquids whereby the free flow of their particles is impeded. It is usually measured by the rate of efflux of a standard column of the liquid in question through an orifice in a standardised vessel. Viscosity is closely bound up with the properties of capiliarity and surface tension and is largely dependent upon temperature. It is sometimes popularly described as "body."

W

WATER IN PAINT.

Paint intended for protective purposes should be absolutely free from moisture but for other purposes a small quantity of water may be beneficial as it communicates to the paint certain physical properties which are of advantage from a decorative point of view. In the grinding of certain pigments a trace of moisture is sometimes desirable as it enables the colour to "pile." Thus in grinding lake pigments a small percentage of moisture is frequently added if it is not already present in the pigment.

WATER ON SURFACES
(See MOISTURE).

WATER PAINTS, DARKENING OF IN SUN.
(See ZINC PAINTS BLACKENING).

WEATHERING.

Weathering is the general descriptive name applied to the deterioration of painted or varnished surfaces exposed to the weather. The rate and nature of the weathering are dependent on the composition and physical properties of the paint and on the nature of the destructive influence. (See FLAKING.)

White Lead Turning Black
(See Blackening of White Lead).

White-Lead, Short.

Ground white lead is described as "short" when it contains too little oil and when on pulling it out with the finger on a palette knife it breaks off into crumbling pieces. White lead which has been ground for some time with the correct proportion of oil is always less short than newly-ground white lead. The presence of barytes increases the shortness. Shortness is an indication of imperfect amalgamation of the oil with the pigment and is therefore to be condemned.

White Spirit.

This is the modern trade name applied to volatile liquids of the petroleum class which find a use as substitutes for turpentine or as diluents and thinners of paints, etc. The determination of the suitability of a particular sample of white spirit for paint should be left to a qualified paint chemist. In general white spirit has less solvent action on resins than turpentine and appears to have no direct drying action.

White, Varnish Turning
(See Varnish Turning White).

Wood, Grain Raised in.

The application of moisture to wood (especially in the case of the softer woods) is liable to raise the grain owing to the unequal absorptive power of the different fibres. Thus after removing paint by means

of a strong alkaline solution or when 'water stains' are applied to wood the grain is often raised. In the case of fine work the surface should be rubbed down and 'filled' with a transparent wood filler after which it can be painted, stained or varnished.

WRINKLING OF VARNISH

(See CRAWLING, CRIMPING, ETC., also DRYING OF PAINT).

Y

Yellow Chrome Fading.

What is described as "fading of chrome" is often in reality the effect produced by the decomposition of the chrome by alkali. (See Alkali in Walls.)

Yellowing of Enamel Paint
(See Discolouration of Enamel).

Yellow Ochre, Chrome in.

Yellow ochre is usually regarded as one of the most stable pigments. Unfortunately it is now difficult if not impossible to obtain native yellow ochre possessing the bright yellow tones which characterised the native ochres of many years ago. In order to meet the demand of painters for brilliantly-tinted ochres it has become quite usual to add to the ochre a small proportion of yellow chrome. In order to make the sophistication less easily detected the chrome is sometimes introduced into the ochre when the latter is in a moist state. The presence of lead chrome in ochre is easily detected by a chemist. These chromed ochres are unsatisfactory pigments as they

may have to be used for purposes for which very stable pigments are necessary, and owing to the presence of lead they lose their permanence in presence of air containing sulphur compounds. Most of the tints described as "golden ochre" now contain traces of lead chrome. It would seem to be the best policy for the painter to purchase his ochre as pure as possible and to do any mixing with chrome or other pigments himself. Cheap ochre paints often contain relatively large proportions of lead chrome on account of the capacity of that material to mask the addition of large quantities of adulterant.

Z

Zinc Oxide, Opacity of

Oxide of zinc is usually regarded as a less opaque pigment than white lead. Much controversy has taken place on this point and experts are not yet agreed as to whether under the normal conditions of painting work modern oxides of zinc should be described as inferior to white lead in opacity.

Zinc Paints Blackening.

That important class of pigments known as "lithopone" is commonly believed to suffer from the grave defect of blackening in presence of bright sunlight. Modern improvements have reduced this tendency to a minimum, but it is undoubtedly the case that pigments containing sulphide of zinc are liable under certain conditions temporarily to turn grey or dark slate colour in the open air. But the discolouration is only temporary, the pigment always regaining its original colour. In the case of the best kinds of lithopone suitable for grinding in oil the darkening effect is hardly met with now-a-days, and the present writer who has been in daily contact with paints and painting work for over twenty years has seen only one bad case and two very slight instances of the defect in the whole of that time. In the case of water paints

however the defect is much more common, although certain manufacturers of sulphide zinc white now claim that they have been able to eliminate entirely the risk of blackening in their pigments even in a water medium. It is noteworthy that a brand of sulphide zinc white which does not discolour in a water medium may discolour in an oil medium and *vice versa*. In view of the largely increased use of sulphide zinc white pigments during the last few years it is wise for painters and other users of such materials to enquire closely into the physical properties of the materials they propose to purchase before pinning their faith to a particular brand.

ZINC PAINTS, PRESERVING OF

Zinc pigments ground in oil should be protected from the air in stock casks, tins, etc., by a thin layer of raw linseed oil spread thinly over the surface. Water should never be used for this purpose. Water causes the paint to become granular and unfit for mixing with oil.

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